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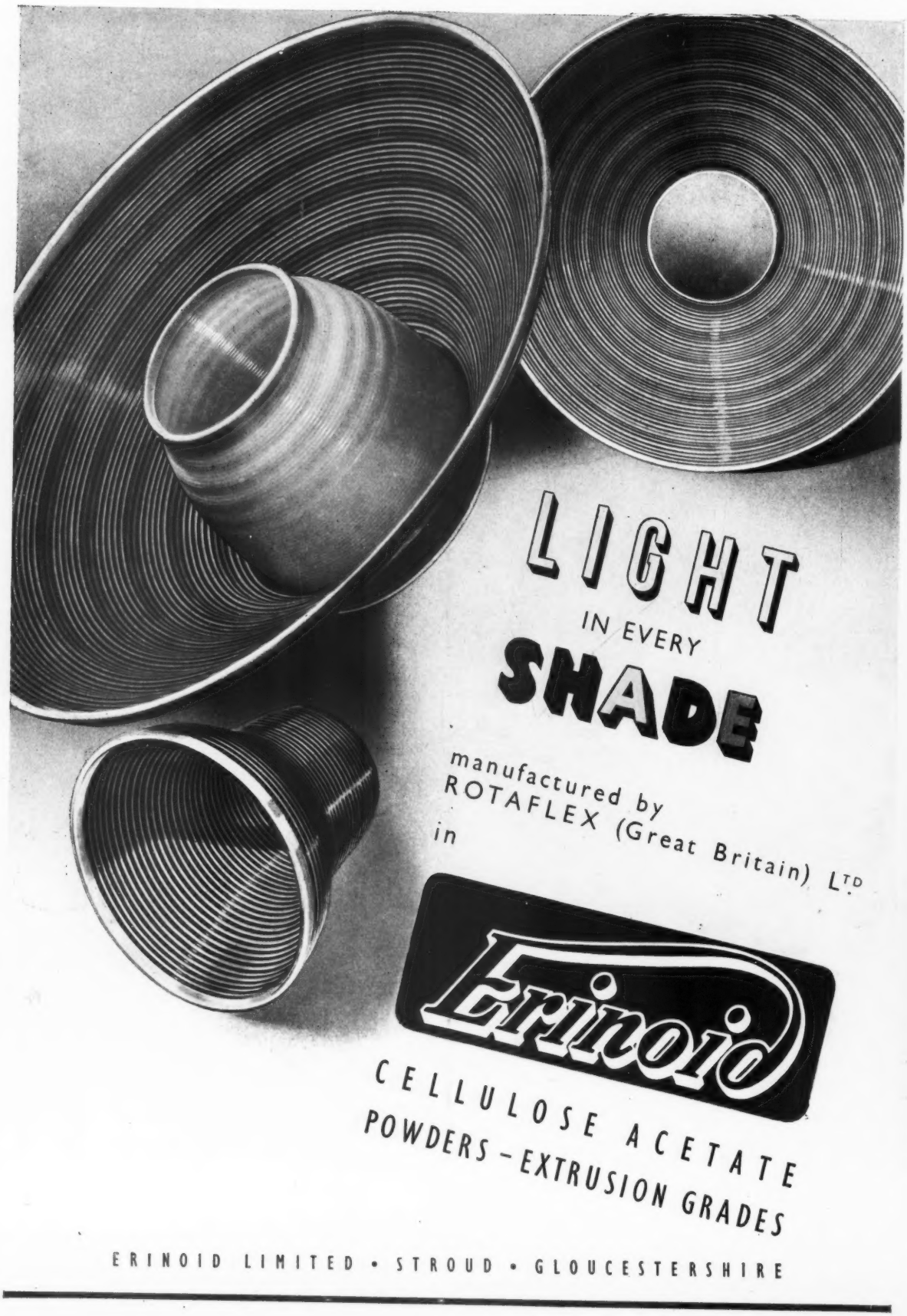
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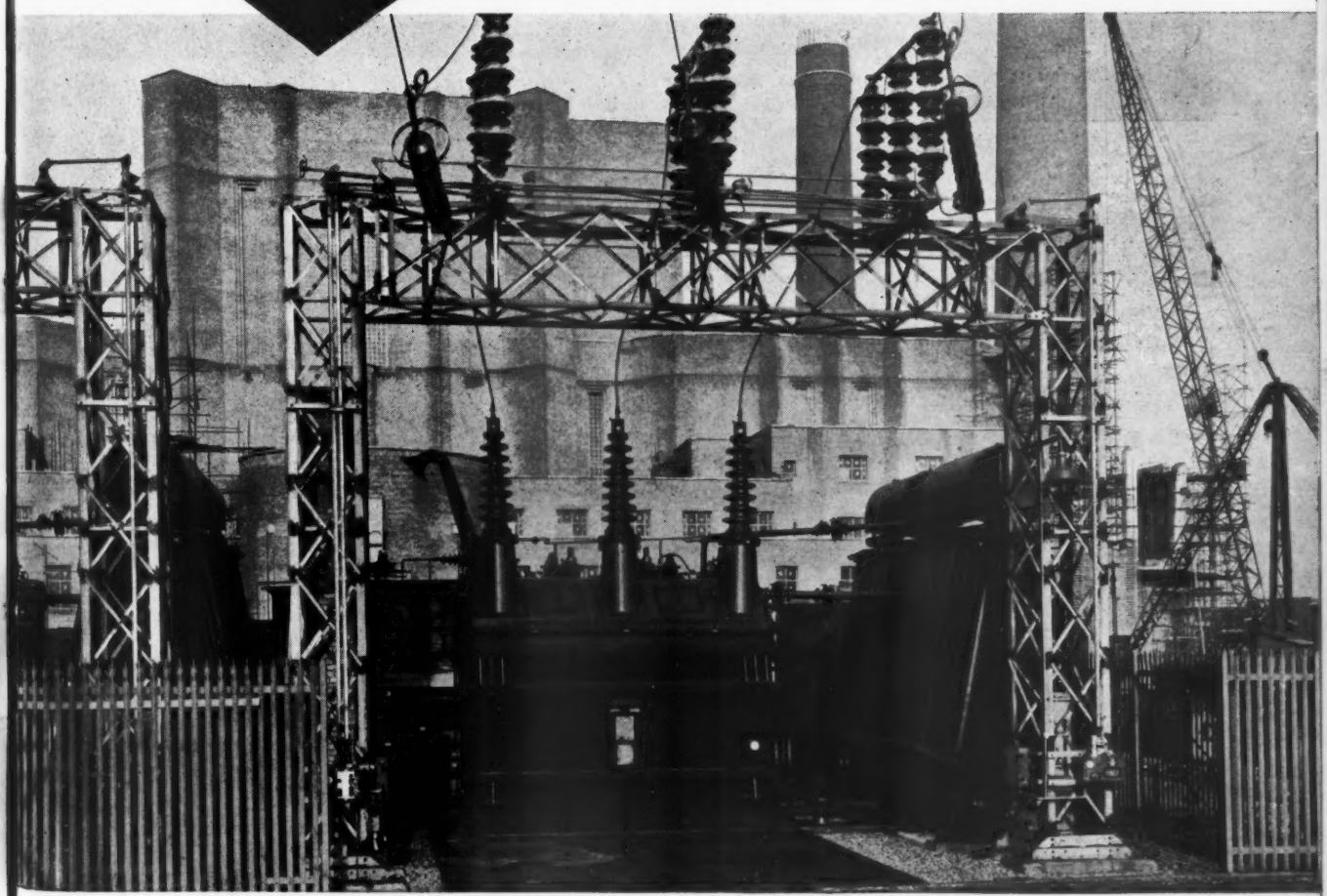
This is a 45 M.V.A. power transformer which feeds the grid at a large power station in Croydon. The vital insulators for the tremendous voltages involved are made entirely from *paper!* Paper—treated in a highly specialized way, turning it into a most necessary component of all power equipment. This is merely one of many instances where the latent strength and power of paper is harnessed to the needs of industry. For all such specialized uses, Tullis Russell, with nearly 150 years experience, are the people to know. They are at your service!



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BOWATERS PACKAGING

Drums across the Sea

Toppers and television equipment are equally at home in fibre drums. To the ever-lengthening list of valuable goods that get about the world in these tough, versatile containers must now be added radar equipment. For the Royal Navy, a Bowater drum is fitted with a polythene liner and the delicate cathode ray tube is packed in a resilient nest of moulded wood wool. The result is a pack that will weather the cruellest of cruel seas. (N.B.—Bowaters welcome inquiries from other Services, not to mention civilians.)

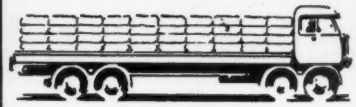
Variety Show

There's never a dull moment in the packaging business. As fast as one problem is solved another pops up. Within the Bowater range of packaging products are a variety of answers to a multitude of problems. Solving problems is the spice of life for Bowater packaging men. In these pages you can see just a few examples of this lively spirit in action.

Conquest of Space

High in the list of economies effected by Bowaters' multiwall sacks is economy of space. Empty, the sacks store neatly in their thousands, taking up the absolute minimum of storage area. Full, they stack close and tight, using to the utmost the space available on the lorry, in the railway wagon or the ship's hold. And the protection they give may be varied by changing the number and type of plies (walls) according to the nature of the product to be carried and the transit risks it runs.

For an ever-increasing number of commodities — from sugar to cement, with a host of other



powders, granules and crystals in between — Bowaters multiwall sacks provide economical bulk packaging.

BULLETIN

SWEET ANSWER

Two things are important to a unit pack for sweets. It must, of course, give the right kind of protection. But it must also be easy to undo. The five popular 'Spangles' lines made by Mars Ltd., are a good example. For fullest protection each sweet is separately wrapped. But it's also easy to undo. How? Bowaters provided the answer—in wax. Not only do waxed wrappers meet both these essential requirements of sweet unit wraps, they also provide a perfect surface for the gay, colourful printing which is such a distinctive feature of 'Spangles'.

Protective waxed wrappings may well be the answer to your problem. Bowaters will be glad to advise.

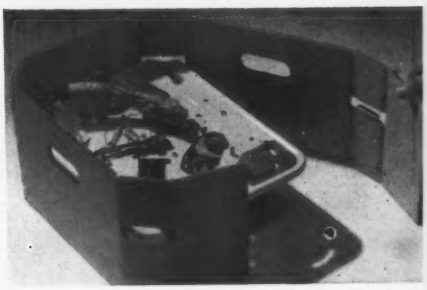
Bags of Bags

The once-humble 'paper' bag appears these days in so many different forms, protecting so many different products, that it deserves a catalogue all to itself. In materials, shapes, sizes and uses, the variety is overwhelming.

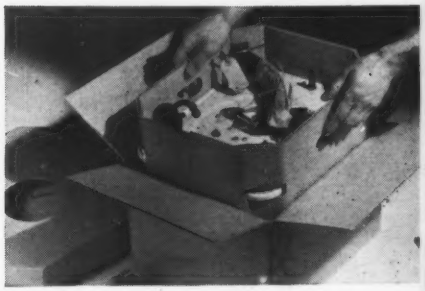
Mile after mile of bags of all kinds roll off the Bowater machines every day. Many go to manufacturers for use in pre-packaging while, for retailers, Bowaters make every conceivable kind of bag, from the greengrocer's 'quart' to the elegant, fashionable millinery bag.

Interesting new uses for paper and other bags are constantly emerging. One of them might answer *your* packaging need.

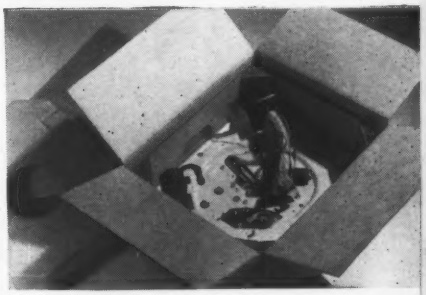
Cut to fit



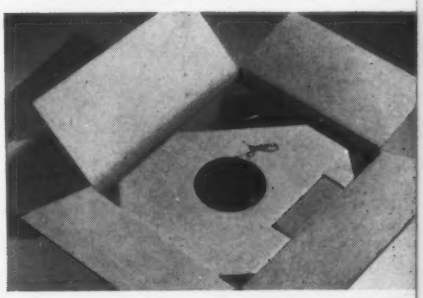
Bowaters corrugated fibreboard cases are built round the product they have to protect.



For this Garrard record changer, for example, Bowaters designed a simple solution . . .



. . . to the problem of getting an instrument of delicate precision safely across the world.



It travels as snug as a nut, the unit being suspended in shock-proof space. Now about **your** *problem . . .*

Bowaters make MULTIWALL SACKS, FIBRE DRUMS, PROTECTIVE PACKAGING PAPERS, CORRUGATED CASES, PAPER AND FILM BAGS *and will be glad to discuss their applications to your business.*

Please write to :

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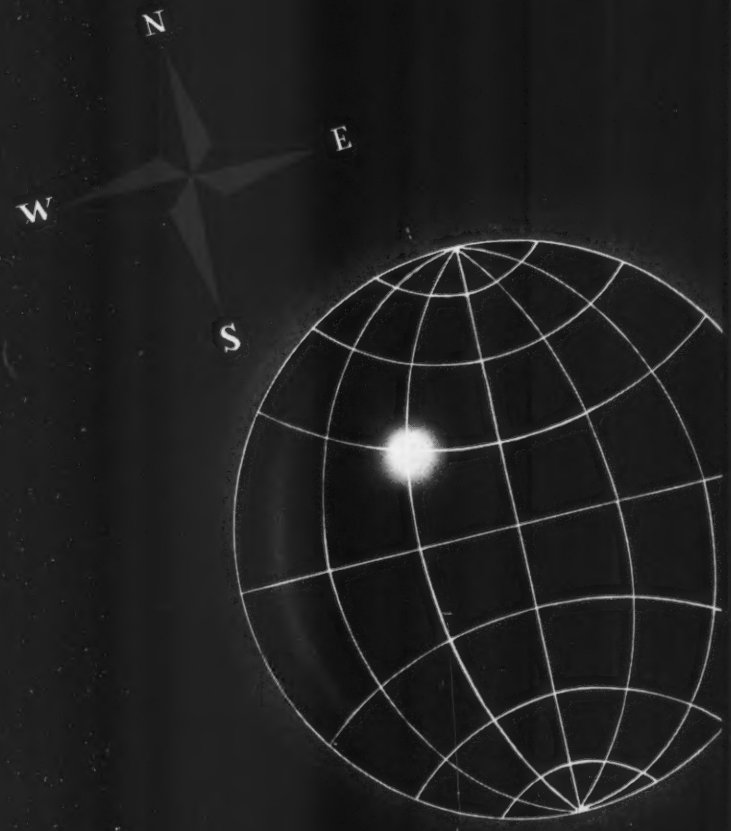

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Quoted from a letter written by a Director of Messrs. Haynes, Ford & Elliott Ltd.

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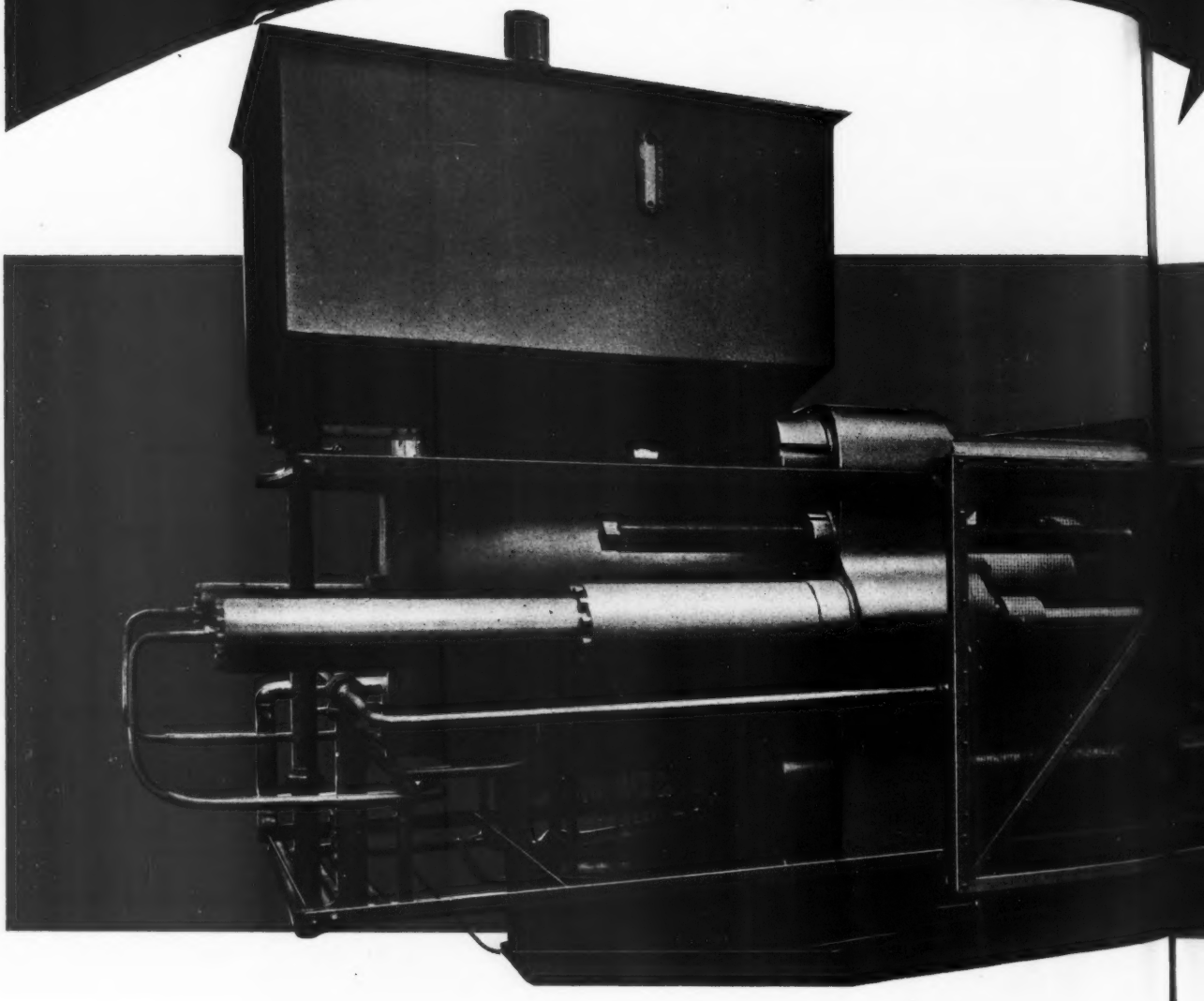

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Platen Size	60" × 60"
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Motor	100 h.p.
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160 oz.

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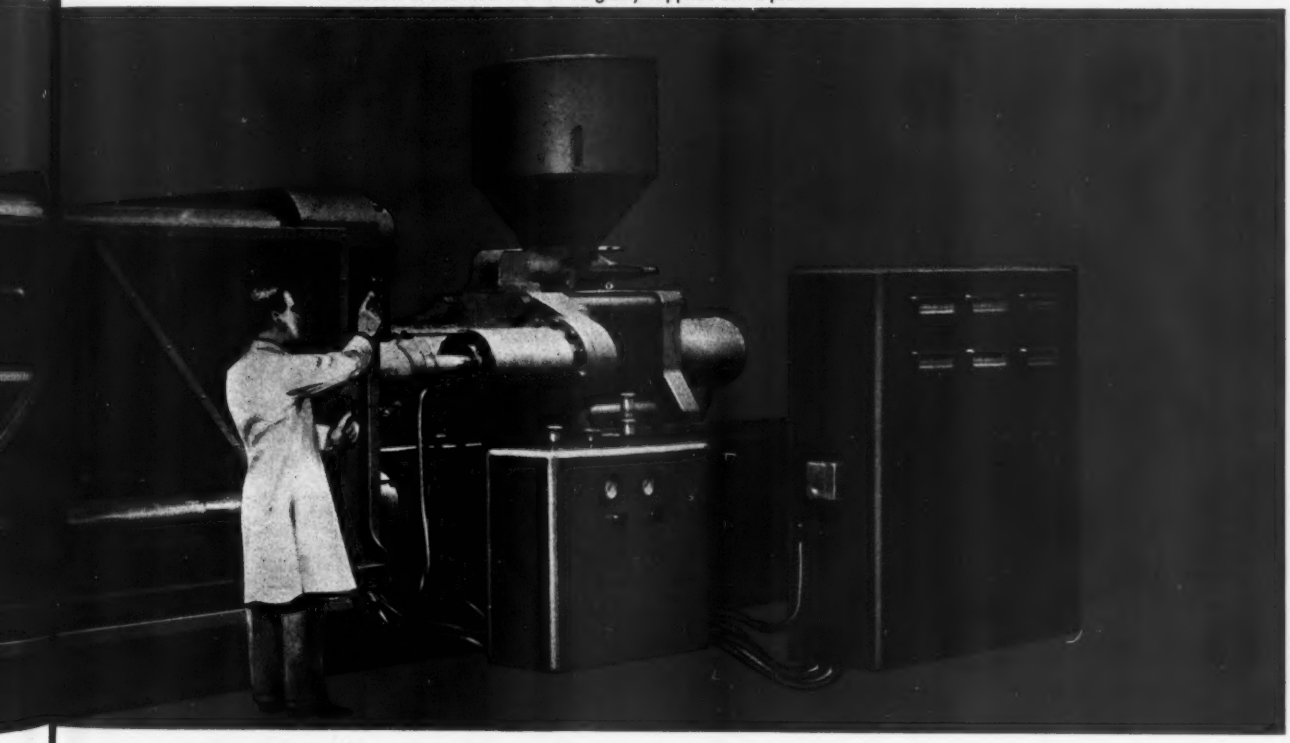
The PECO "IN-LINE" Preplasticiser has been developed over the past three years and embodies the results of a continuous research programme and the experience gained on a number of prototype machines. Simplicity of design ensures safe and continuous production performance.

The large motor horsepower enables a rate of injection of 80 cubic inches per second to be achieved—this figure being CONSTANT over the whole pressure range—a considerable advantage, especially with very large mouldings.

The PECO Packomatic Compensator is fitted as standard equipment, ensuring the reduction of internal stress.

Full details of the machine will be gladly supplied on request.



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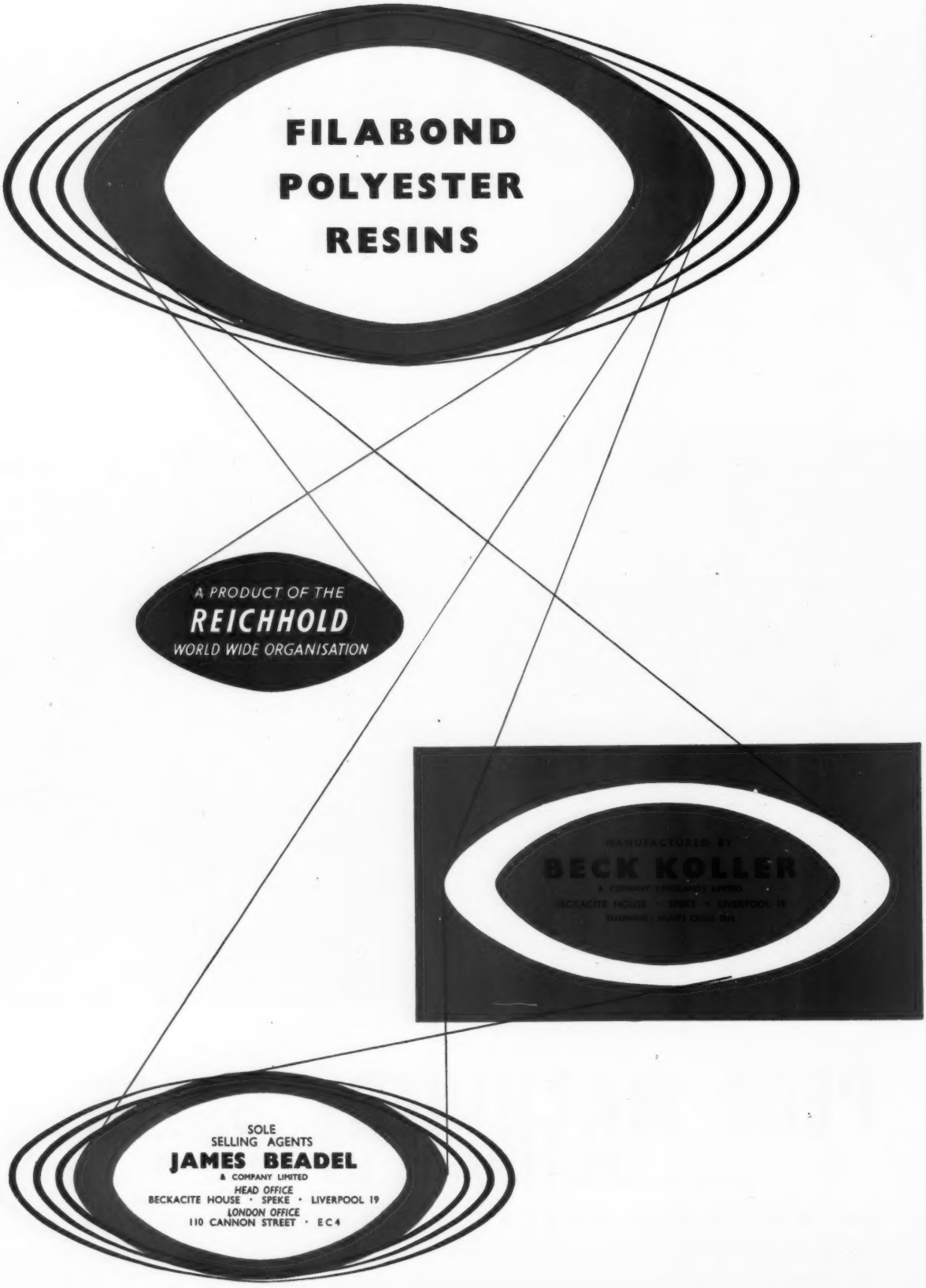
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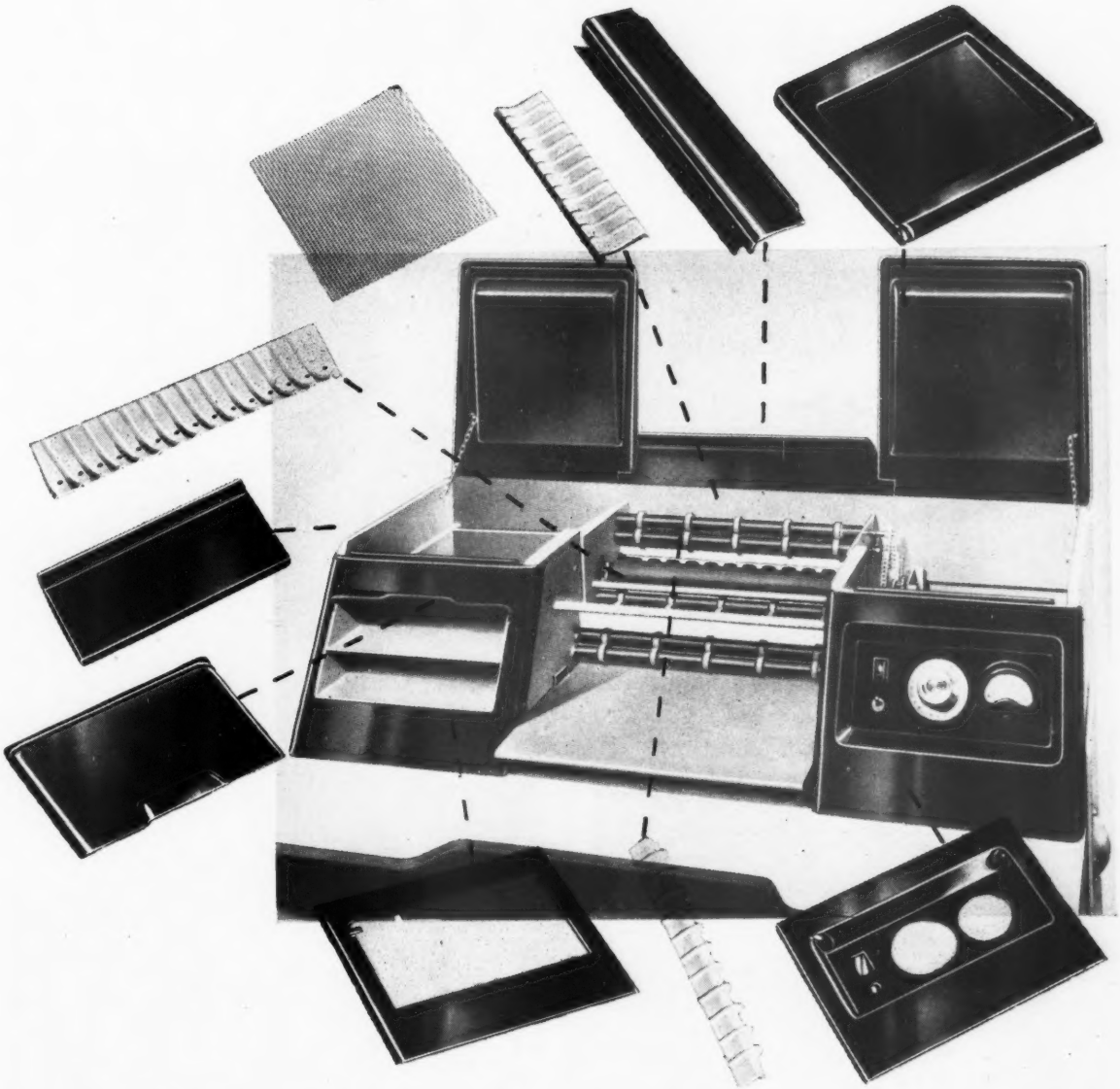

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Many parts of the "furniture" of the Remington photocopying machine have to sustain progressive chemical attack. So they are made in Cobex. But Cobex has another important virtue: it is easily formed by ordinary draw or drape moulding —at a fraction of the cost of the expensive dies required to make the same article in metal or other materials.

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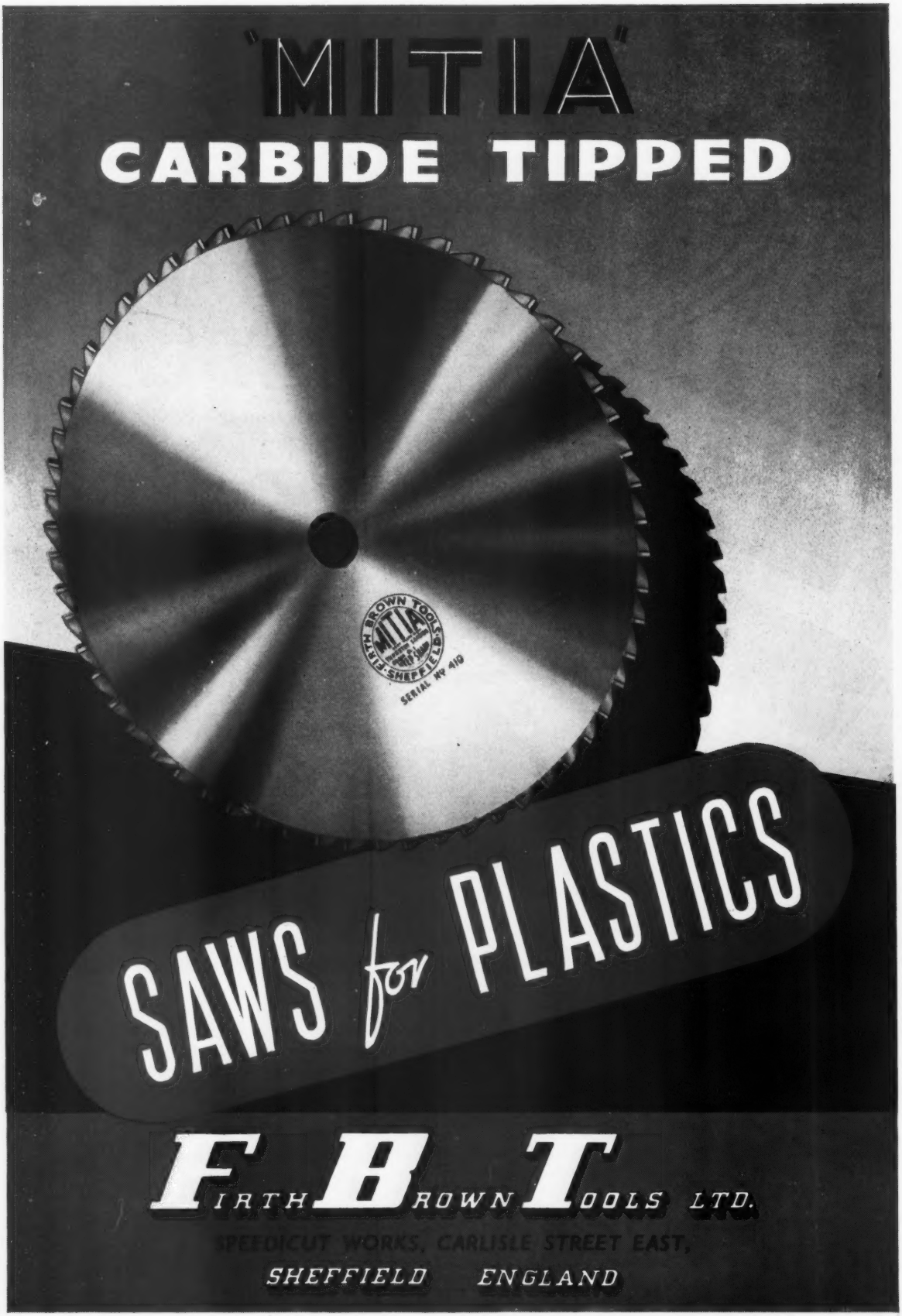
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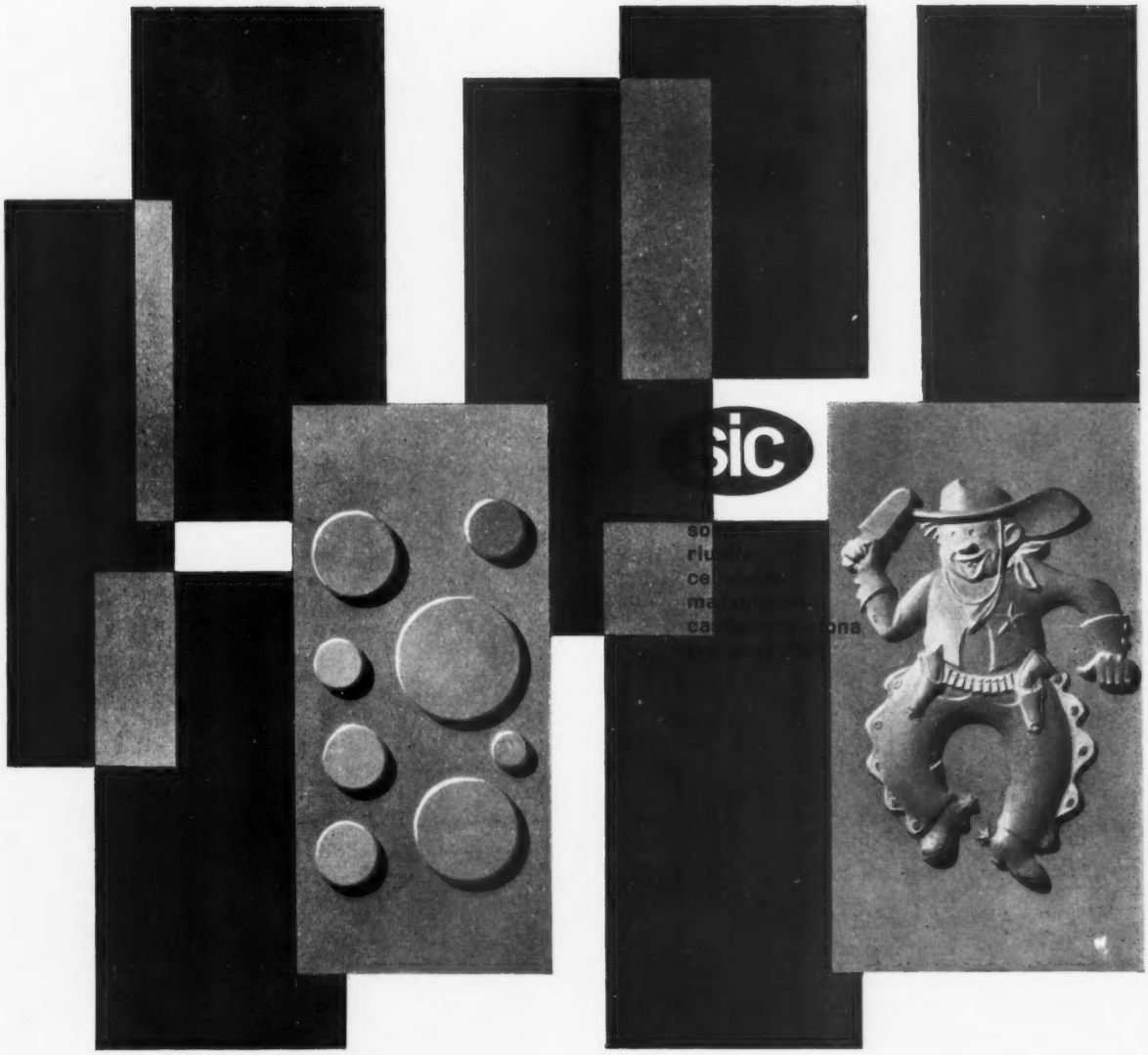

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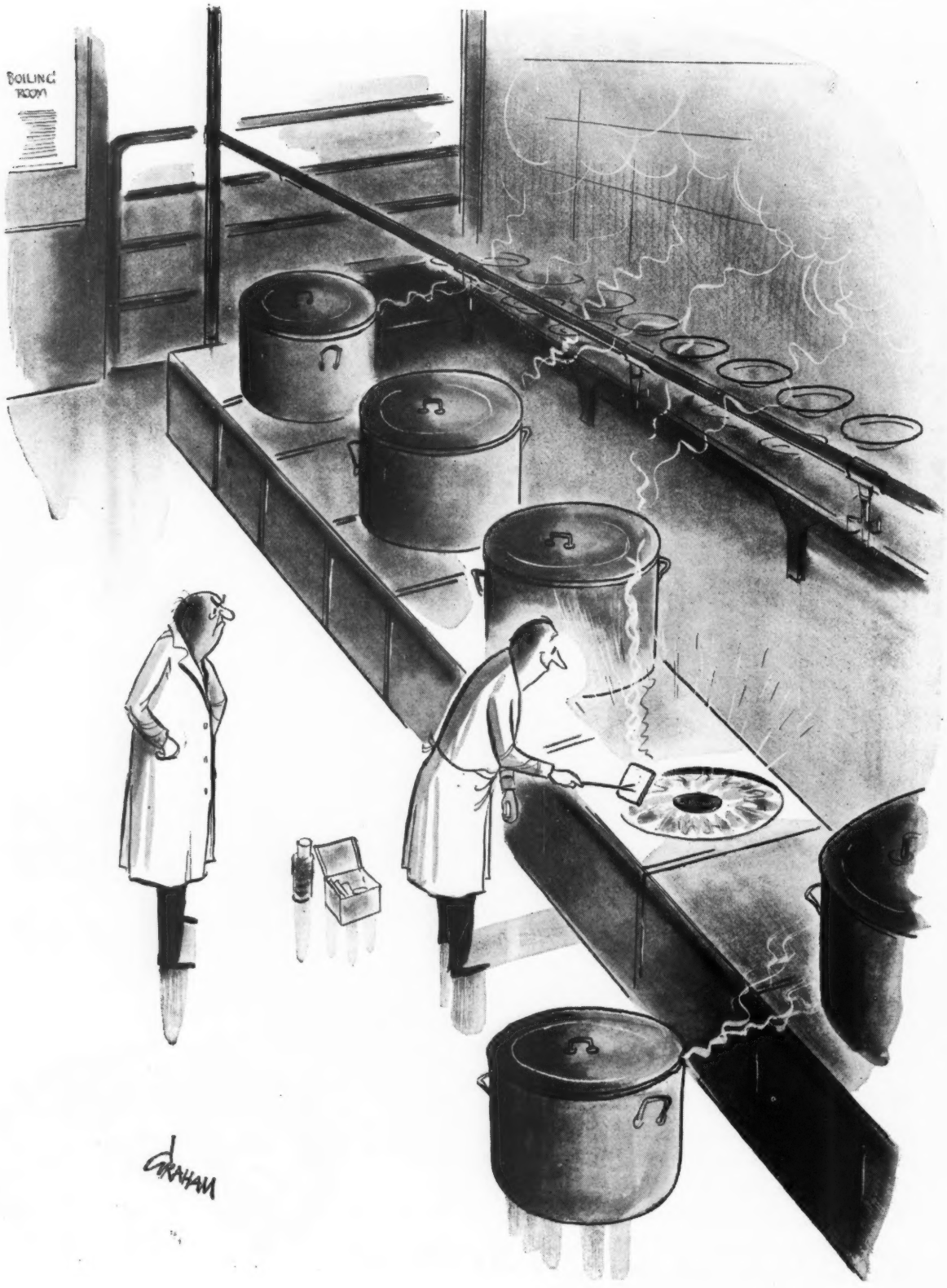

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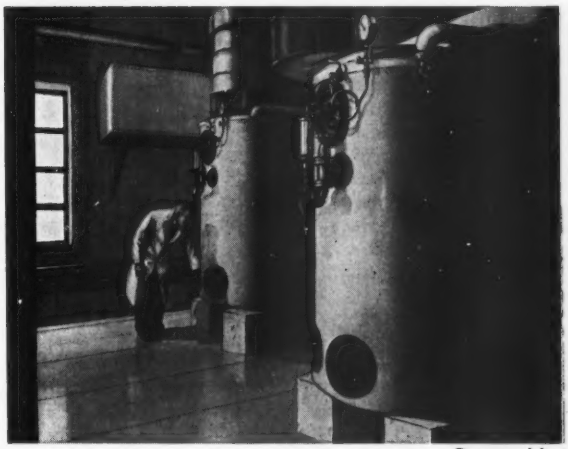

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Technically speaking

Overall dimensions of the cabinet are 8″ high x 12¼″ x 5″. Four internal bosses take self-tapping screws and, to prevent sinkage, pre-formed inserts are used, so avoiding undue changes in section thickness. It is moulded in polystyrene, with a shot weight of approximately 23 oz.

EKCO plastics for industry

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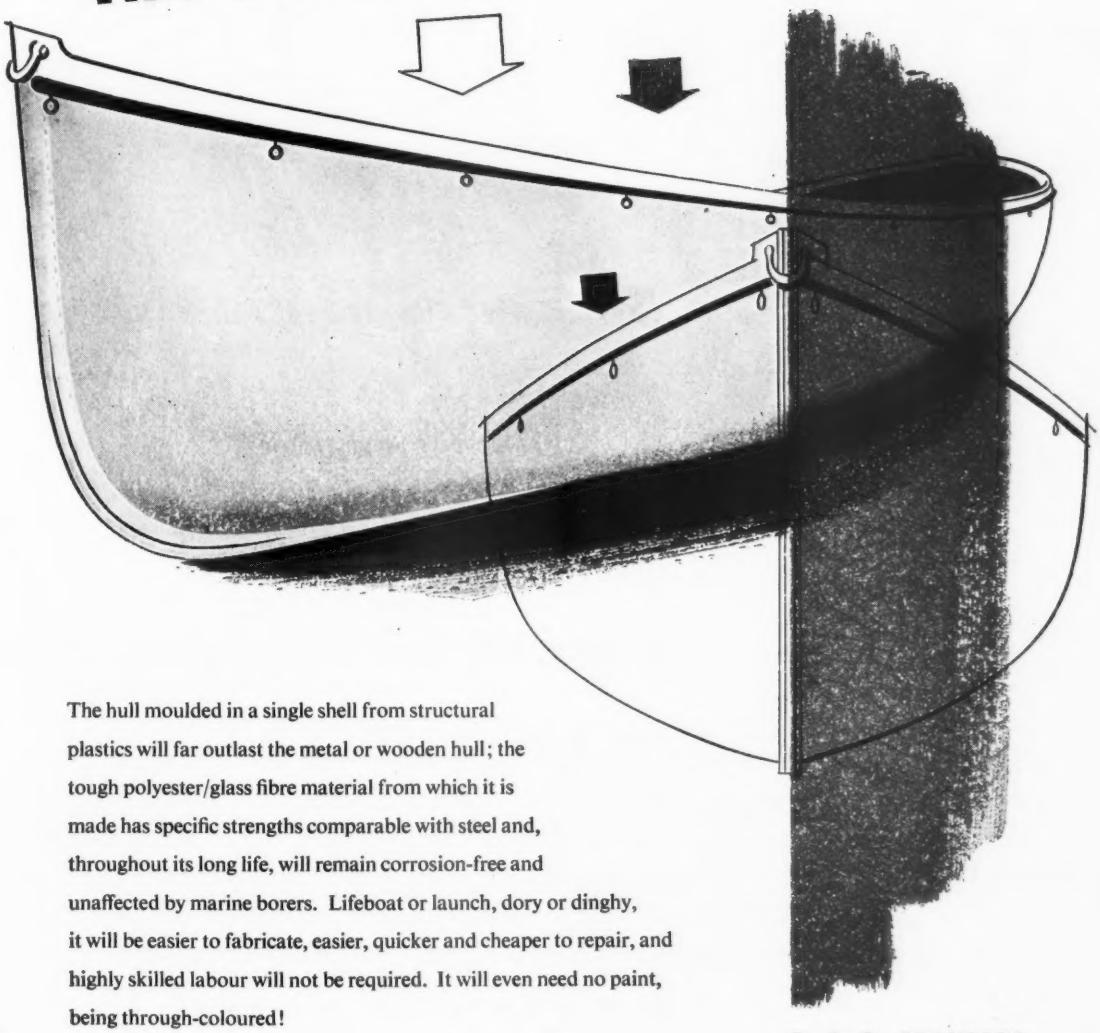
This lifeboat will have nine lives!



The hull moulded in a single shell from structural plastics will far outlast the metal or wooden hull; the tough polyester/glass fibre material from which it is made has specific strengths comparable with steel and, throughout its long life, will remain corrosion-free and unaffected by marine borers. Lifeboat or launch, dory or dinghy, it will be easier to fabricate, easier, quicker and cheaper to repair, and highly skilled labour will not be required. It will even need no paint, being through-coloured!

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- **CHEAPER TO REPAIR** *and quicker, too.*
- **SKILLED LABOUR UNNECESSARY**—*semi-skilled labour can be used.*

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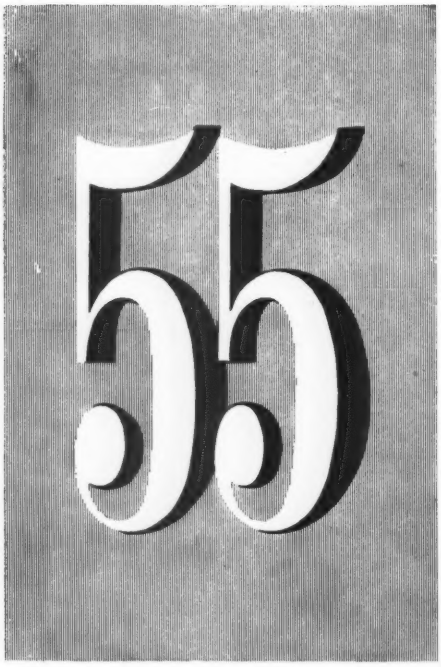

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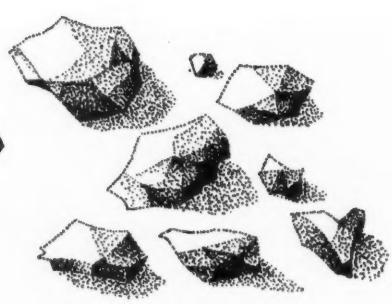
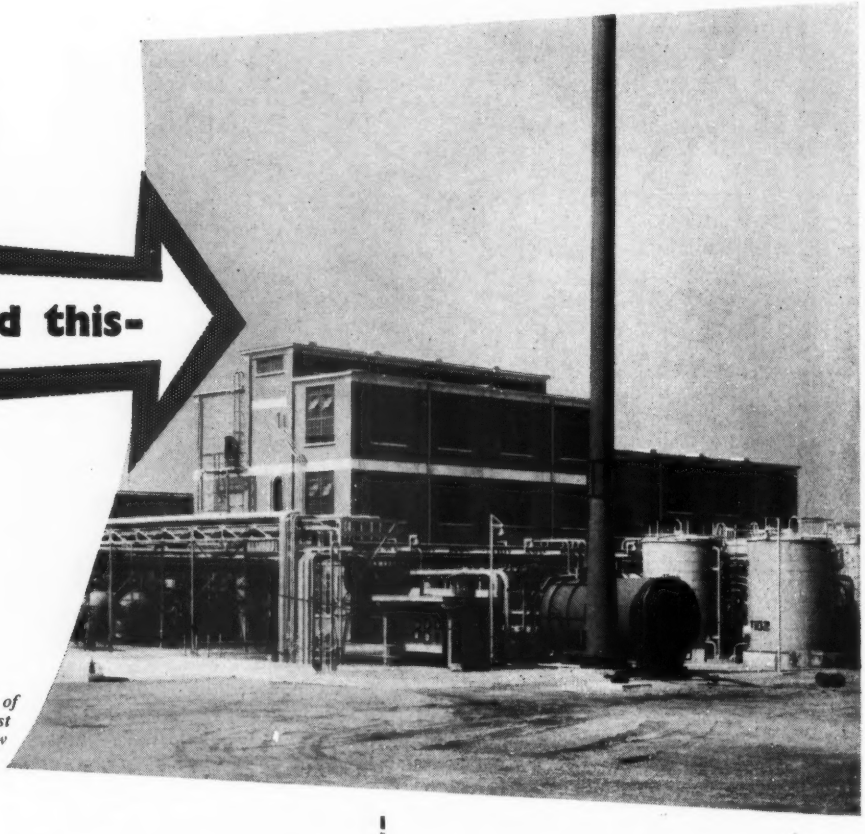


Demanded this-



New plant for production of Epikote Resins is the latest addition to Shell's Stanlow installation.

Rapid growth in the demand for Epikote Resins from the paint, plastics, electronics and associated industries (and from the end-users of their products) made this home production centre essential. Hitherto imported from Shell's plant in Holland, Epikote Resins are now available in ample supplies to meet the growing demand from industrial Britain.

* *Epikote Resins are the outstanding new synthetic resins which have brought a unique combination of toughness, flexibility, adhesion and chemical resistance to surface coatings; these and other important properties also give them special advantages in the manufacture of printed circuits, castings, laminates and other applications.*

SHELL **Shell Chemical Company Limited,** 105/109 Strand, London, W.C.2. *Tel: TEMple Bar 4455*

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Out in front

AND STAYING THERE!

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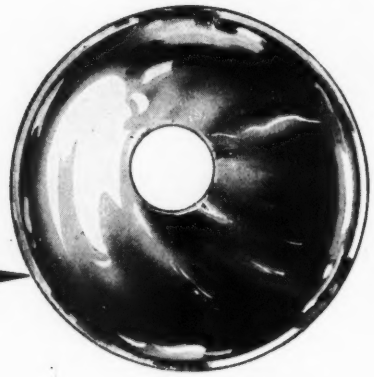
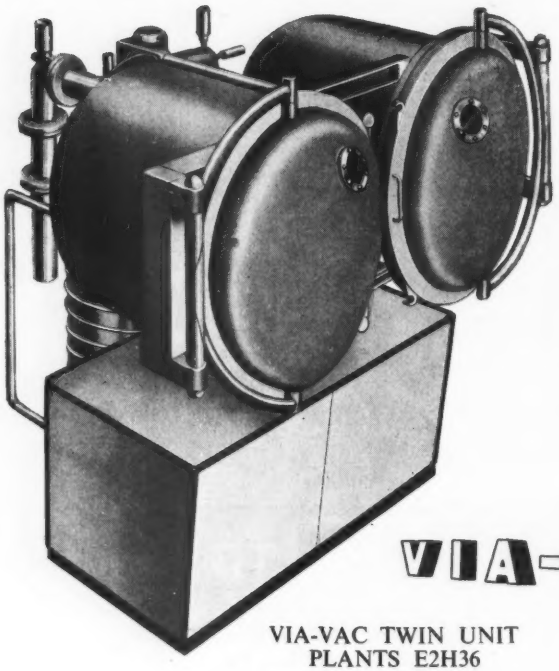
reflectors processed in



V.I.A. HIGH VACUUM COATING UNIT

High quality appearance and low production costs



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PLANTS E2H36

FOR industrial application of high vacuum technique it is essential that the vacuum plant be kept in continuous operation. The new design of the Via-Vac E2H36 Twin Unit enables loading, unloading and evacuation to proceed simultaneously, using only a single pumping system. This has been achieved by dispensing with the traditional rigid connections between pump and work chambers and replacing these with electrically operated clamping devices. This enables the chambers to be interchanged between loading and pumping positions.

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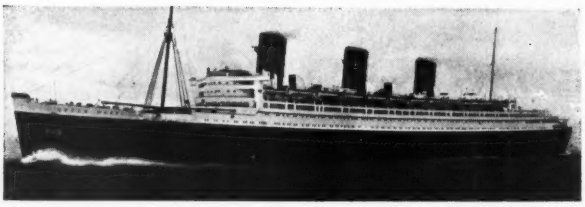
10 years of Atlantic crossings for

LAMINATED PLASTICS

in 'Queen Mary' cocktail bar . . .



Through ten years of continual service, the cocktail bar of the 1st Class Observation lounge of the R.M.S. Queen Mary—refitted immediately after the war—has kept its original freshness and charm.

This is largely due to the hard-wearing finish of its surfaces—its walls and its bar top. Made from a famous laminate based on Melamine resins, these surfaces are easy to clean, hygienic and pleasing to the eye; and thanks to Melamine resins, they have a hard, glossy, scratch resistant finish that is proof against spirits, stains, cigarette burns—and is far better than any previously obtained.

Not only in luxury liners—wherever they are used—laminates based on Melamine resins are the best available today.

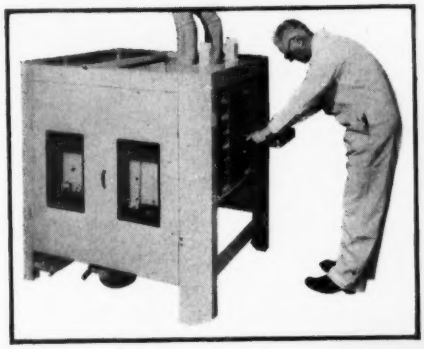
British Oxygen Chemicals make only the *chemical* Melamine; names and addresses of manufacturers of Melamine resins and moulding powders will be supplied with pleasure. Please write for further information to:-

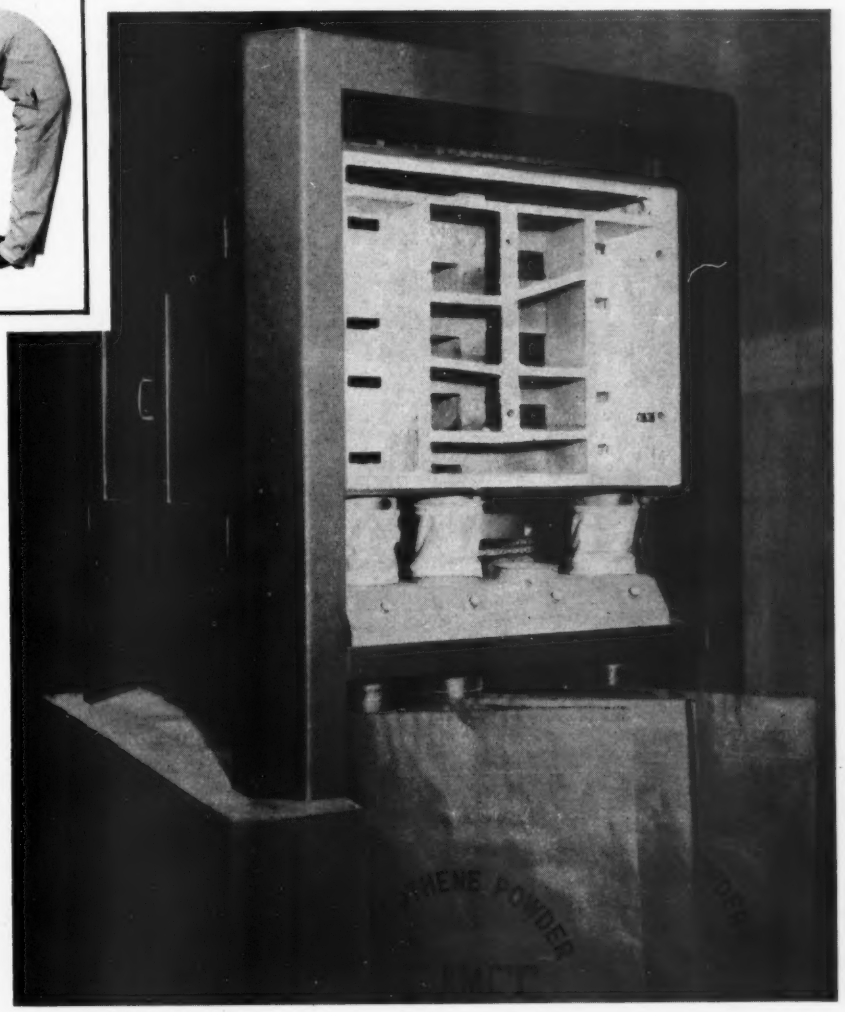
British Oxygen Chemicals Limited, Vigo Lane, Chester-le-Street, Co. Durham. Tel: Birtley 145. London Office: Bridgewater House, Cleveland Row, St. James's, London, S.W.1. Tel: Whitehall 9777.

Burning cigarette ends, stains or spirits cannot damage this bar top. A quick wipe, and it is sparkling and clean.

Photograph by courtesy of Warerite Limited

SIMPLIFIED, HIGH SPEED SIFTING OF MOULDING POWDERS with the Simon Junior Sifter





This Junior Sifter, installed at T. C. & M. Co. Ltd., has the side cover removed to show the internal sieving arrangement.

For trouble-free sifting of moulding powders, the Simon Junior Sifter will take a lot of beating. Big names in the plastics industry including Telegraph Construction and Maintenance Co. Ltd., find that Junior Sifters are ideal machines for high-capacity screening, grading and sifting.

The powerful rotary motion of the horizontal sieves gives positive separation with absolutely dust-free operation. Junior Sifters can be fitted with mechanical feeders or they can be incorporated into your existing processing system. Let us talk to you now about your sifting problems.

Industrial plant by **Henry Simon Ltd** SIMON ENGINEERING GROUP

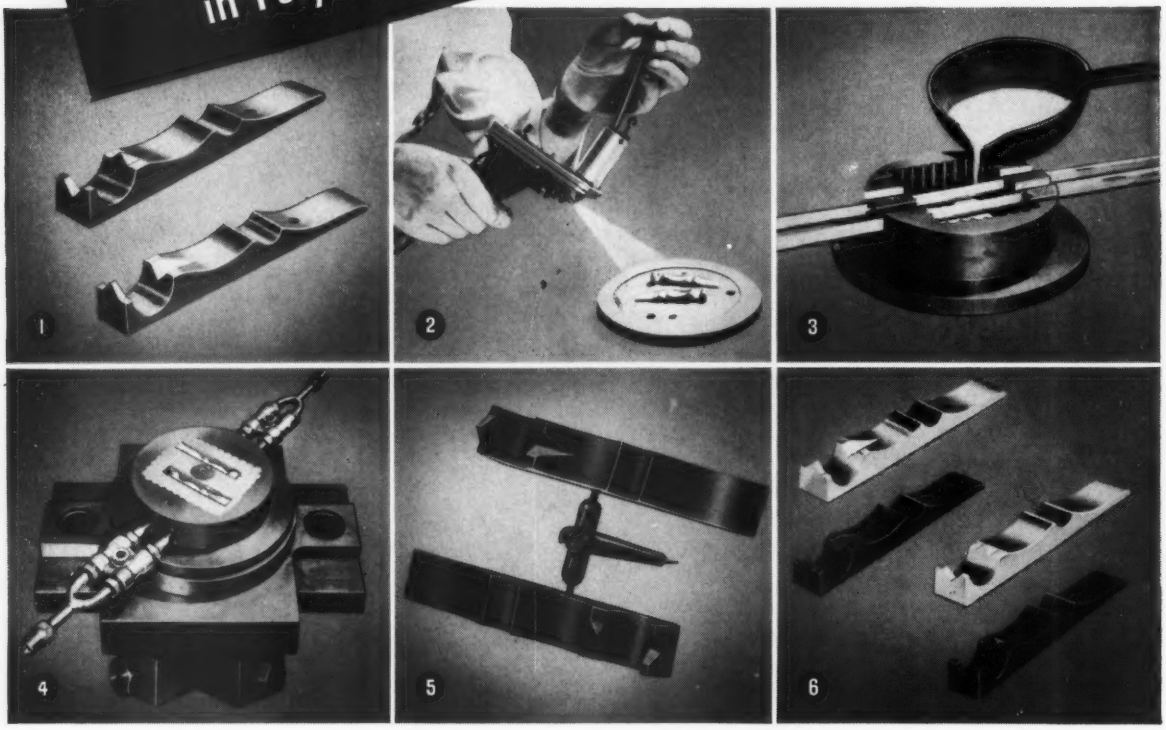
STOCKPORT, ENGLAND

HS 191

33 HOURS from PATTERN to PRODUCT in Polystyrene

For the First Time!

By courtesy of Messrs. S. Smith & Sons (England) Limited, we illustrate manufacture of injection mould for production in Polystyrene in a total time of 33 hours and a fraction of cost of machining.



1. Aluminium master pattern.
2. Spraying pattern with Cerrocast.
3. Pouring molten Cerrocast to back sprayed shell and embed water cooling tubes.
4. Complete mould. 5. Typical shot.
6. Comparison of patterns and mouldings.

★ *Technical advice on the selection and application of correct alloy to suit your problem available on request.*

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★ An Advisory Service which will help you to plan your factory and make the best use of mechanical handling equipment.

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'Alkathene' brand of polythene is very easy to mould into intricate, hygienic, tough and gaily coloured children's toys . . . toys that are light in weight, *will not shatter* and being pliable, cannot hurt children if they fall on them.

Polythene has the lowest specific gravity of any plastic in the world and it is now one of the most economical.

Polythene was discovered, developed, and is sold under the trade mark 'Alkathene,' by

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P.595

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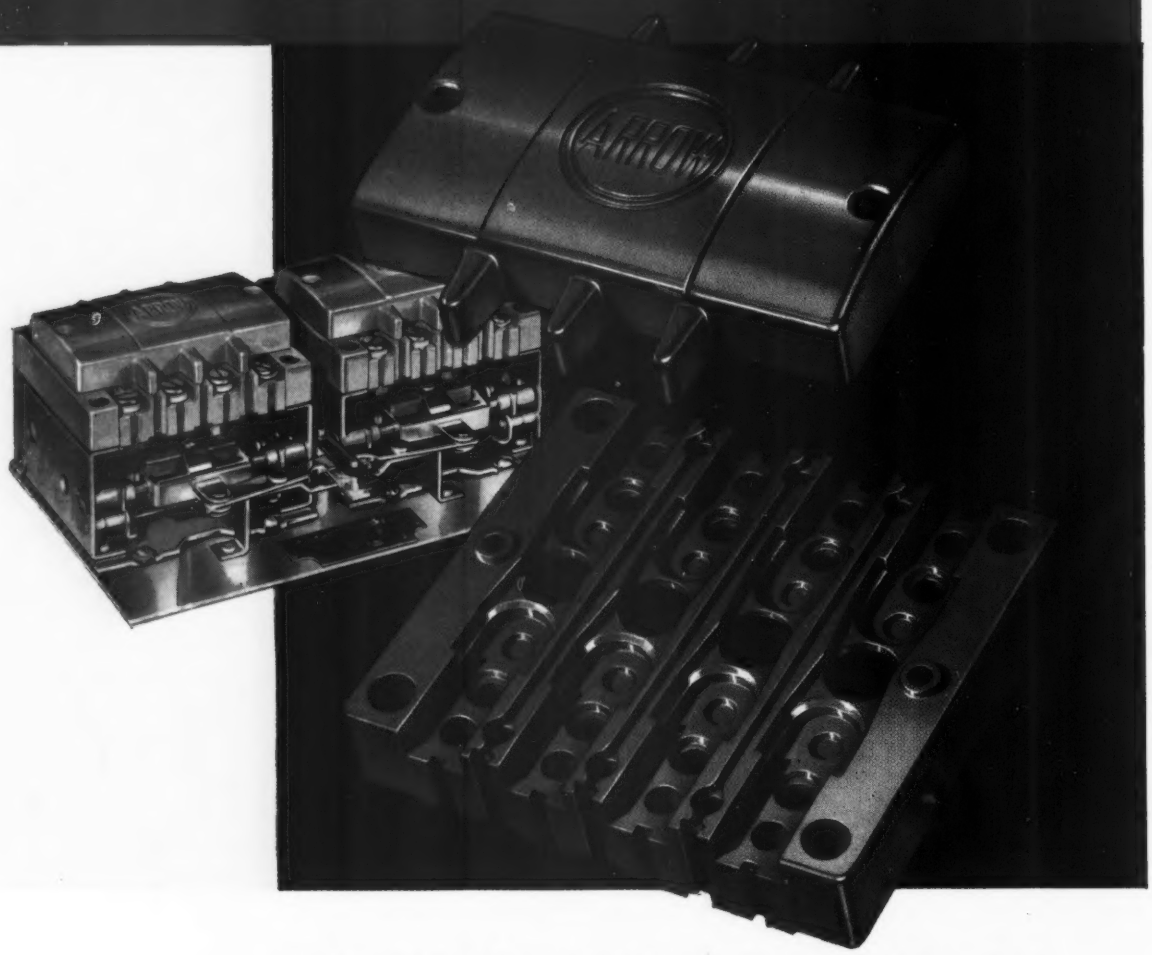
NEW APPLICATIONS



Arrow Electric Switches Limited — very old friends of ours — required Hood and Base Mouldings for their latest type of Magnetic and Mechanically Interlocked Contactors possessing extremely high resistance to tracking and arcing. To meet these stringent requirements, a comparatively new material — Alkyd Thermo-setting Resin — was chosen. Special steel moulds were designed and careful moulding control devised. The result — a new Arrow Component bang on the target. INSULATORS LTD. are manufacturers of standard or "tailor-made" Plastic Mouldings of every description. The "know-how" gleaned from 28 years of continuous service is at your disposal with every inquiry.

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Catering for the 'Heavy Insert'

So irresistible did Debroy Gourmet find the succulent oyster that he was wont to consume stacks of them without even bothering to remove their shells, much to the annoyance of the oysters themselves, who were conditioned to being unclothed before despatch. It did not do Debroy much good either!

The constant passage of unyielding shellfish decayed his teeth and necessitated their replacement by plastic substitutes. Even these failed to stay the course; teeth chipping off at every meal, until his mouth looked more like a rockery than anything else.

Being a seafaring man, it was easy for Debroy to lash these tooth-fragments to their plastic moorings with nylon fishing-line made fast with a blood-knot! His teeth neither chipped nor broke again.

He called at our Works one day, and our Technical Director noticed the result of this accidental combination of plastic and nylon; how the nylon gave elasticity to the plastic plate and so accommodated "heavy inserts" without any ill-result.

He hurtled off to invent "NESTORITE" Grade A.864, a perfect nylon-filled moulding powder, most suitable for mouldings carrying "heavy inserts."

YOU'RE RIGHT WITH 'NESTORITE'

NESTORITE **GRADE A.864** *(Patented)*

ELECTRICAL LOW LOSS

Filler	Nylon Modified
Particle size (inches)	3/8 flake
Specific Gravity	1·22
Bulk factor	3·5—4·5
Powder density	0·25—0·35
Time of cure of test cup (secs.)	75—85
Recommended flow range	15—20
Shrinkage (thou./inch)	13·0—15·0
Flowability (cm.)	9—10
Brinell Hardness	30—35
Coefficient of expansion of moulding per°C.	0·000058
Impact strength (ft./lb.)	0.15—0.25
Crossbreaking strength (lb./sq. in.)	10,000—10,500
Tensile strength (lb./sq. in.)	6,000—8,000
Elastic modulus in tension (lb./sq. in.)	4×10^6
Water absorption (7 days) (mg.)	40—100
Dimensional stability in water (thou. per in. of mldg.)	6
Dimensional stability in air (thou. per in. of mldg.)	Negligible
Plastic yield grading (°C.)	100
Blister temperature (50°C. per hr. rise)	175
Electric strength at 90°C. minute value (V/mil.)	30—100
Surface resistivity after immersion ($\log_{10}$ohms)	11·5—12·5
Volume resistivity (as moulded) ($\log_{10}$ohm cm.)	12—14
Power factor at 10^6 c/s	0·015—0.02
Permittivity at 10^6 c/s	3.7—4.2

A phenolic material containing nylon as a filler and modifier with exceptionally long flow, flexibility, a measure of impact resistance, good machinability and high electrical properties (at normal temperatures).

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makes fashion rainwear news with 'Alpaca' effect

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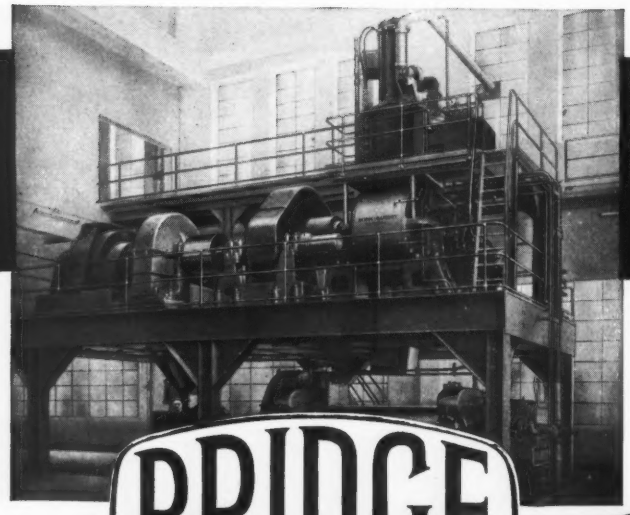
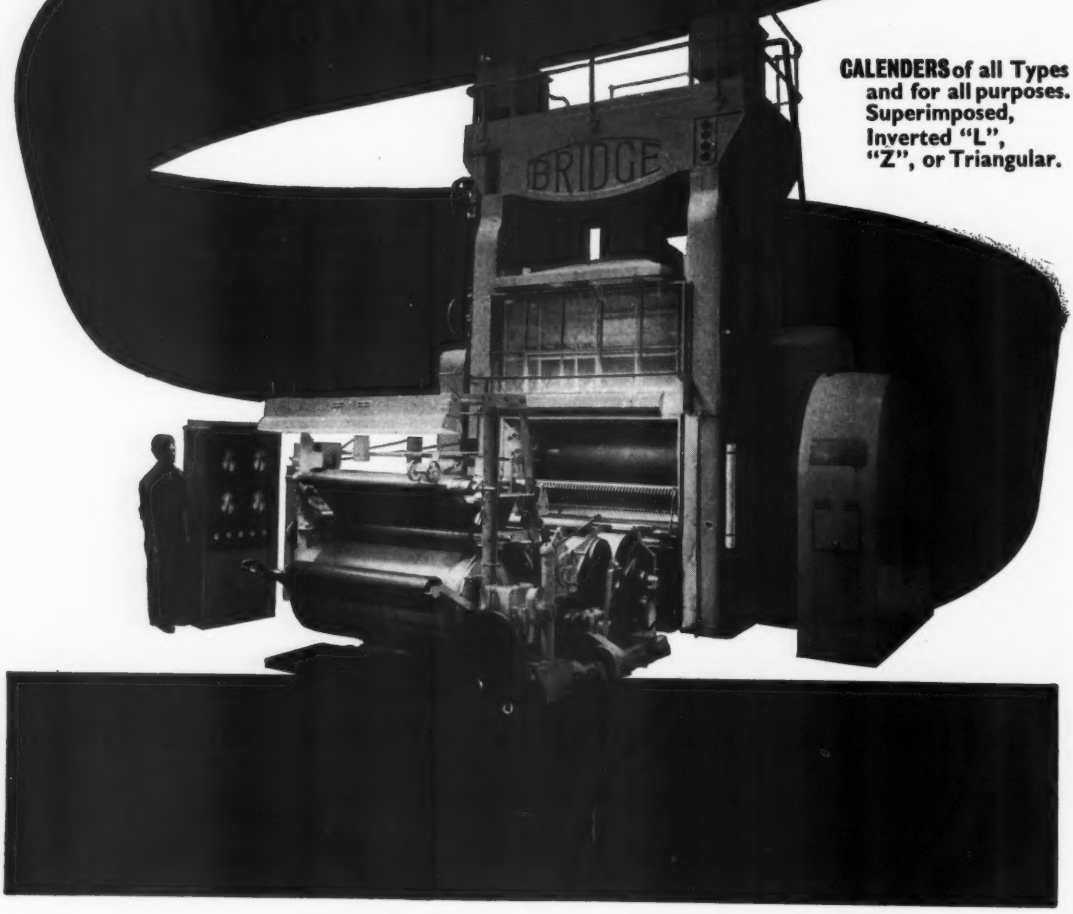


BRIDGE

efficiency compo



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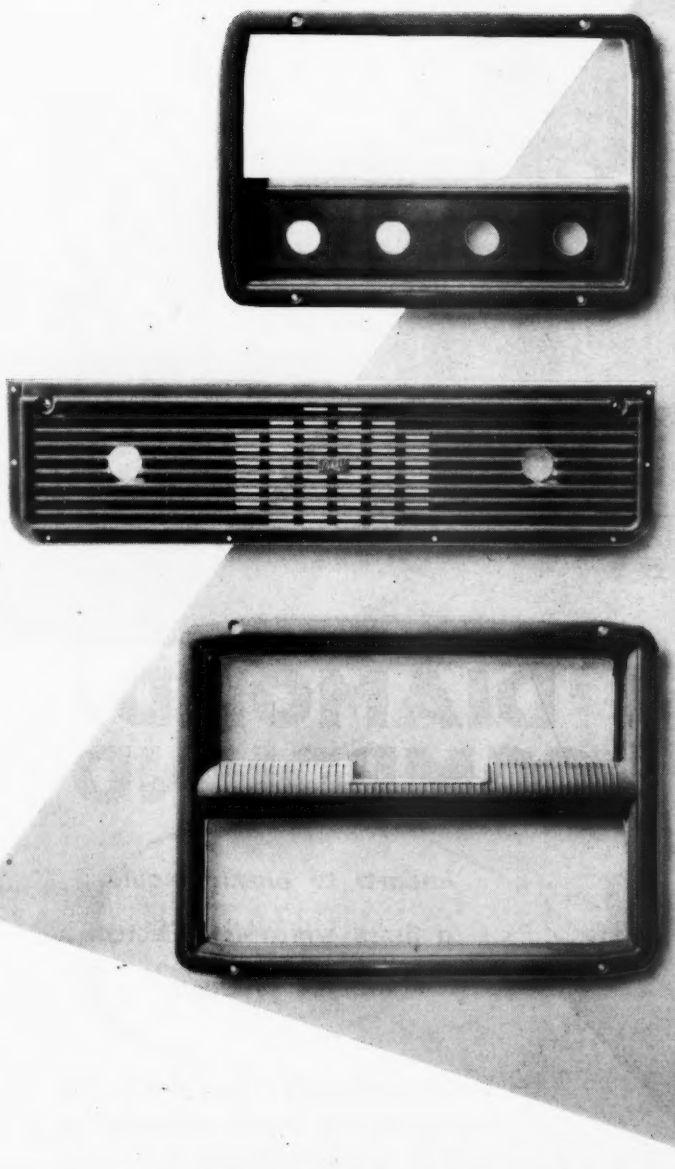

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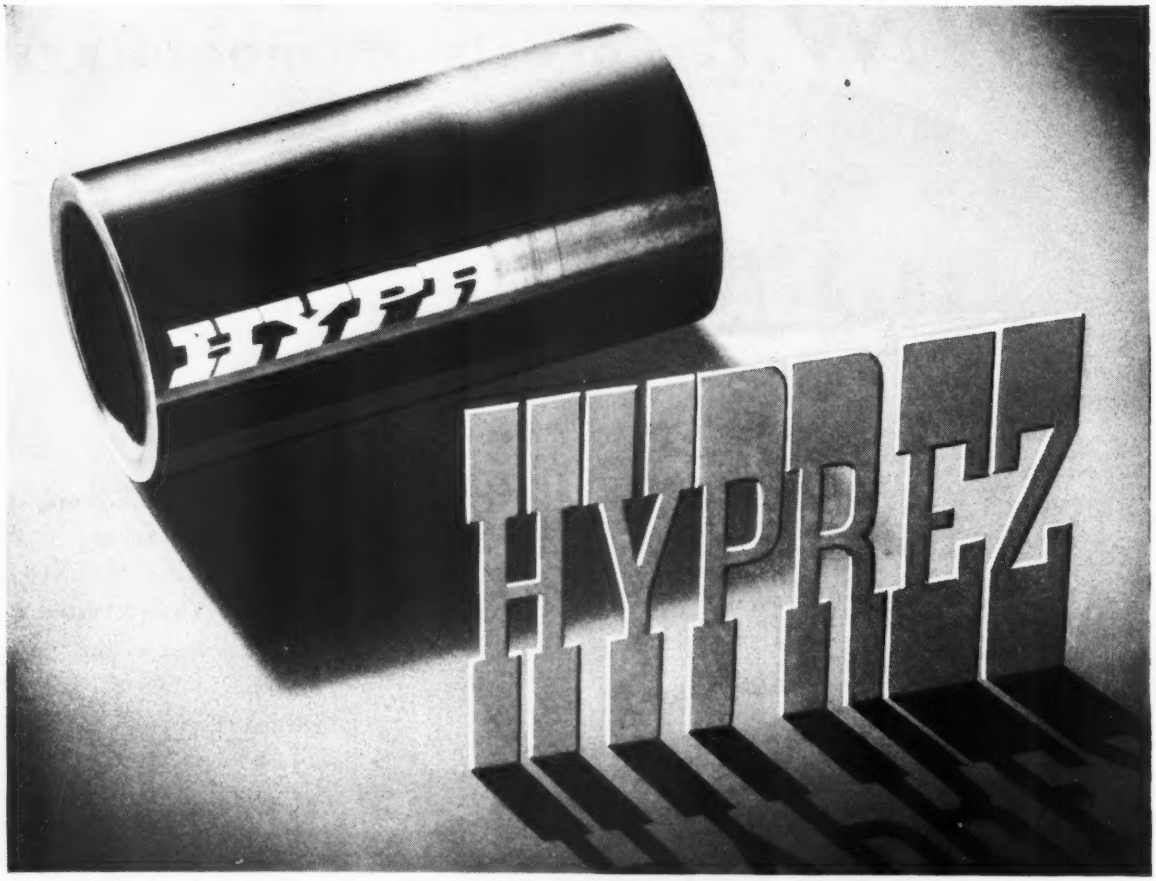
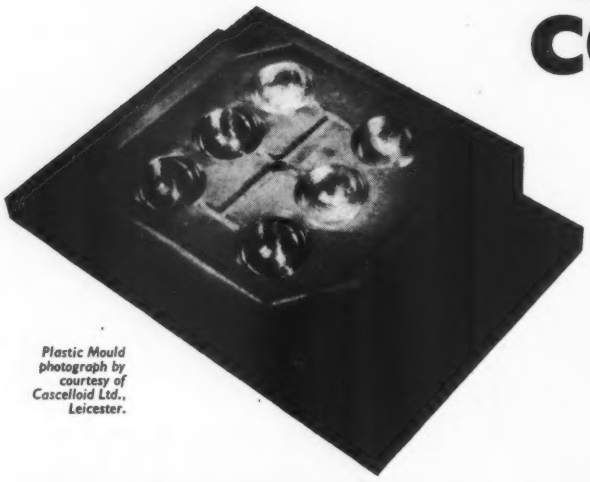


DIAMOND COMPOUND



Plastic Mould photograph by courtesy of Cascelloid Ltd., Leicester.

imparts to plastic moulds a finish which is reflected in the product.

The illustration (left) shows a plastic mould part-finished with Hyprez, part-finished to a normal degree.

For full details, please apply to :

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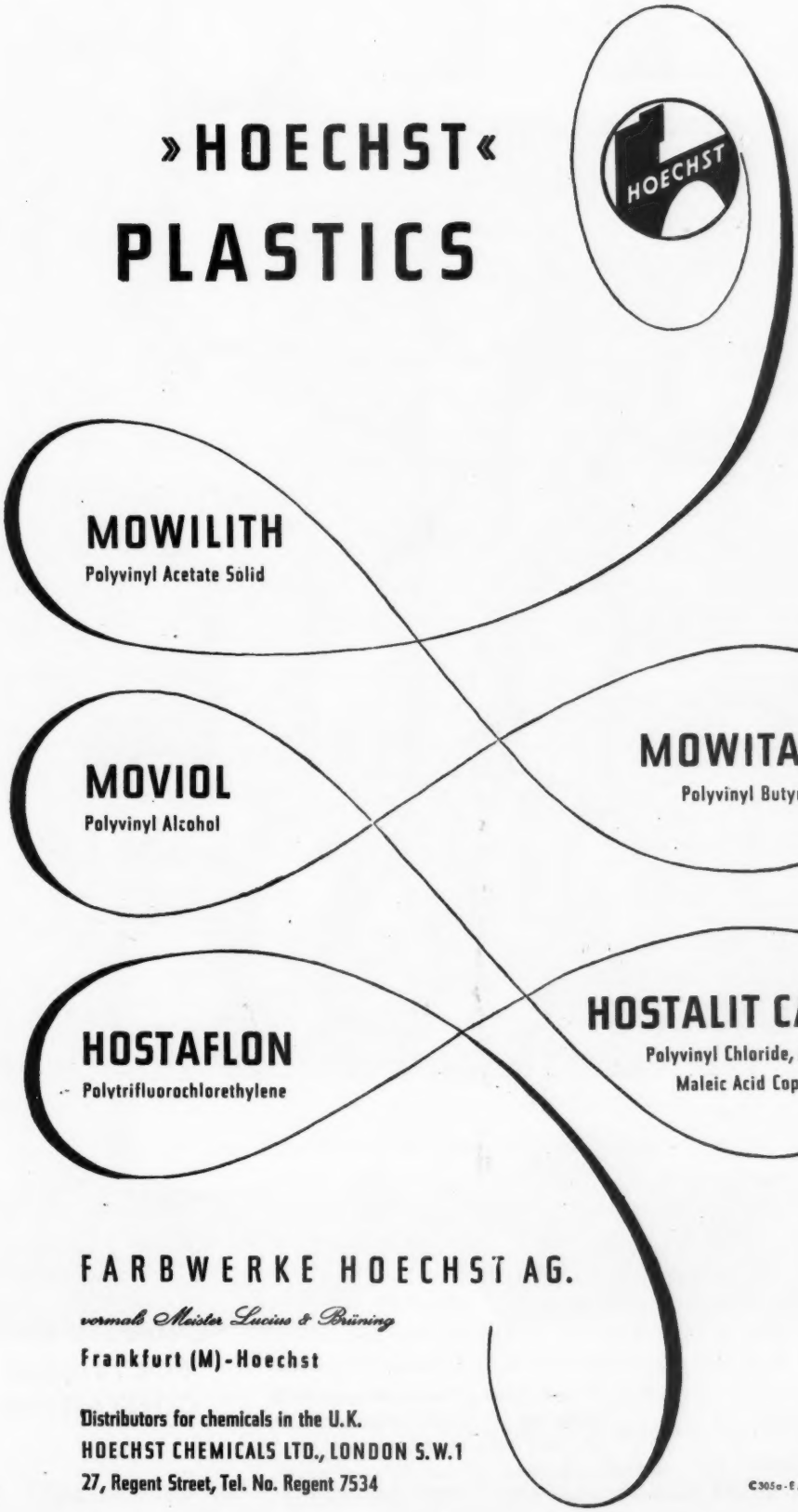
PLASTICS



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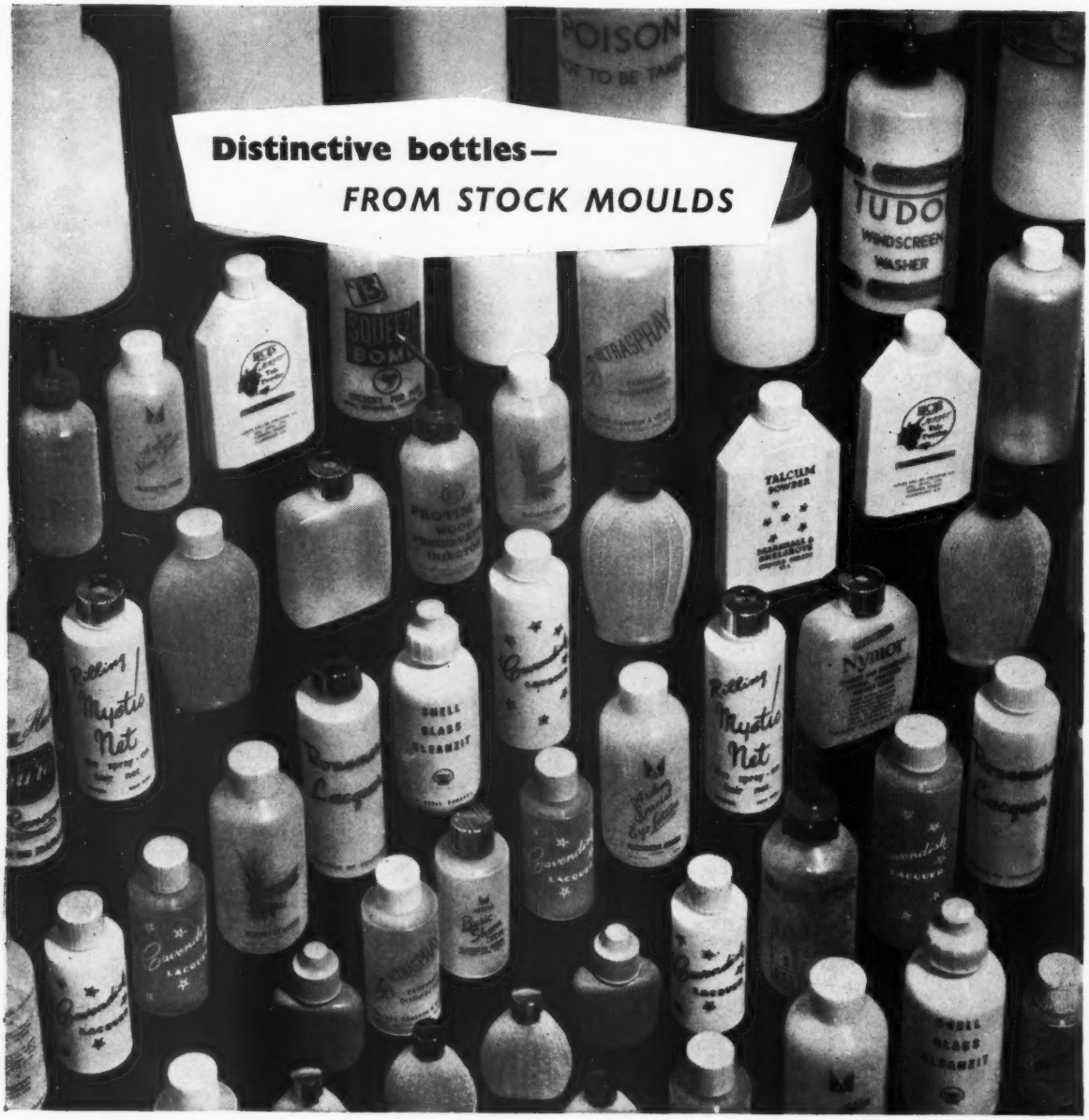

These bottles have all been produced from stock moulds, and individuality is obtained by ringing the changes with colours and contrasting colour printing to give your product that tailor-made packaging look. If your product needs to be sprayed, puffed, poured through a small aperture, dispensed drop by drop or just packaged attractively, then Poly-Tainer have the answer to your problems. We make these unbreakable polythene containers in all shapes and sizes from 4 cc. to 15-gallons, and the choice of colour is yours. Distinctive coloured Poly-Tainers from stock moulds means that your product can have an individually styled package **without any tool costs.** *Of course, we undertake custom styling on request.*

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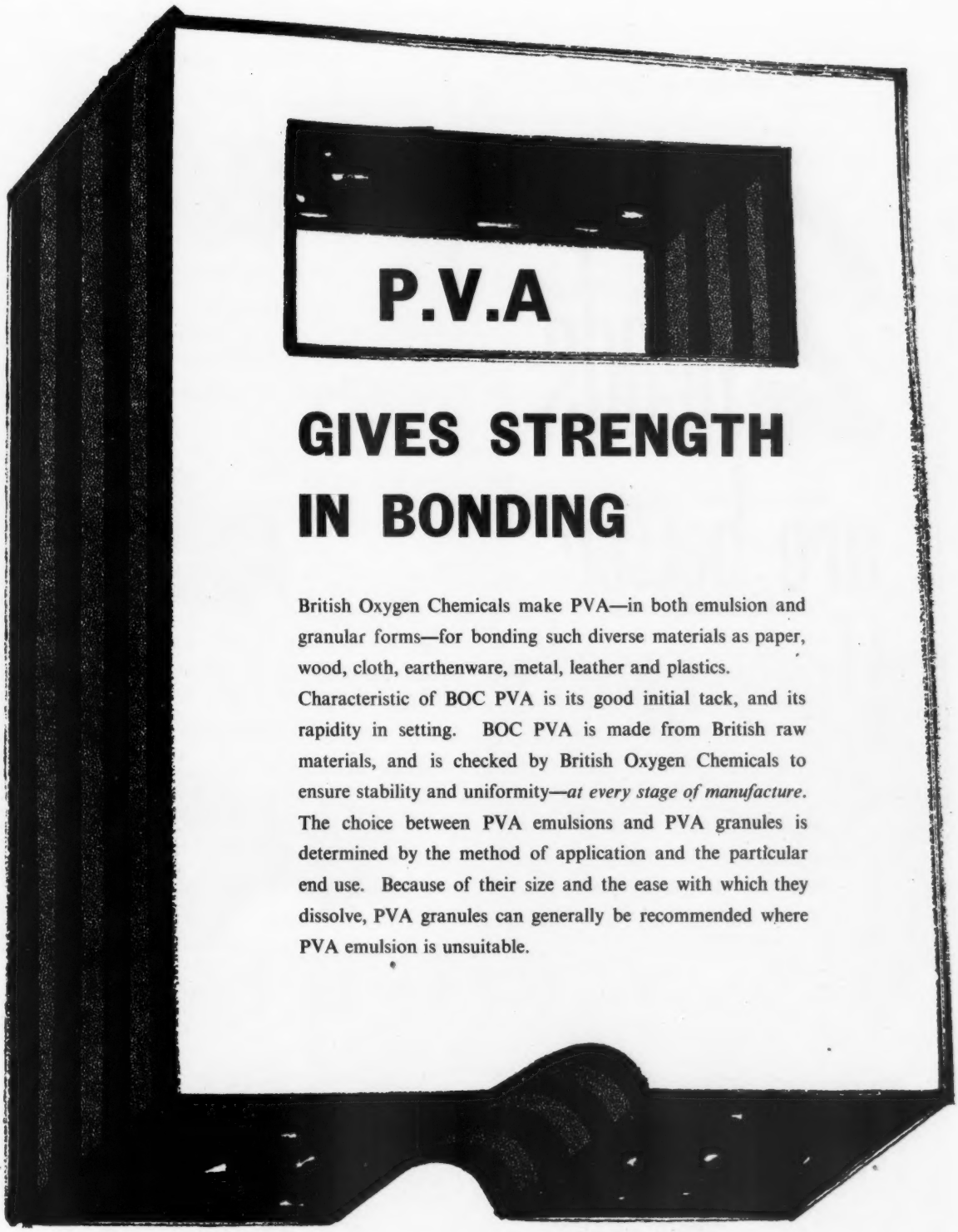

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Vigo Lane, Chester-Le-Street, Co. Durham. Tel.: Birtley 145.
London Office : Bridgewater House, Cleveland Row, St. James's, S.W.1. Tel.: Whitehall 9777.

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✻ "THE GREATEST THING ON EARTH IS MAN, THE GREATEST THING IN MAN IS MIND."

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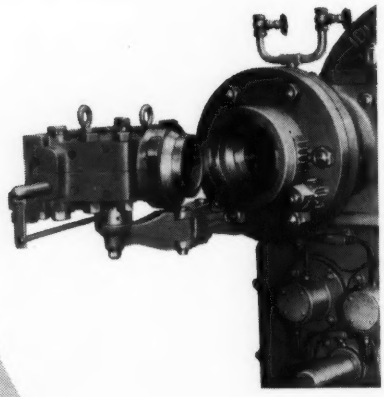
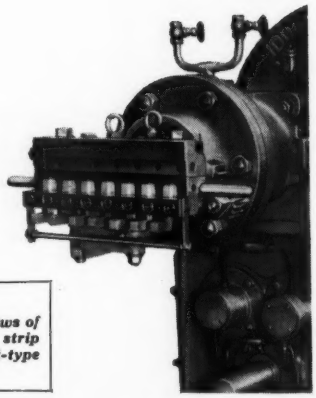
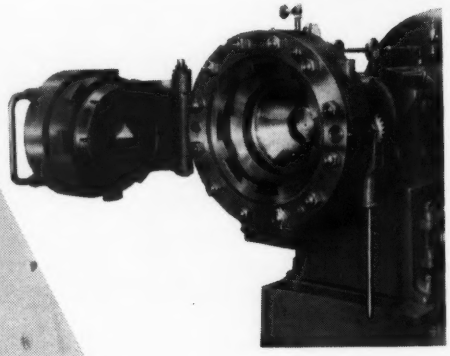
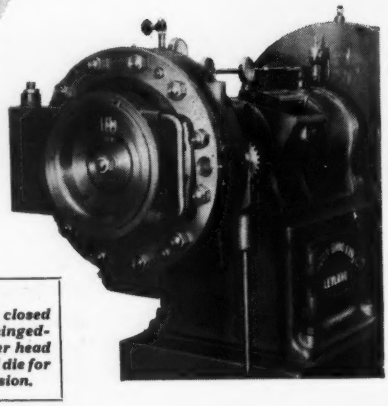




BV. 4-5
Open and closed views of electrically heated strip head with a bayonet-type locking.





BS. 9-10
Open and closed views of hinged-type strainer head with special die for sheet extrusion.

CHEMICAL DIVISION

"Supertone" Urea Formaldehyde moulding powder in a practically unlimited range of colours, opaque and translucent. (Export only). Also "Supertone C", a Urea Formaldehyde moulding powder with a special cellulose filler resulting in mouldings of high transparency. (Export only).

ENGINEERING DIVISION

Moulds as well as special machinery for the plastics industry; also a Product Styling & Mould Design Service.

PLASTICS PRODUCTS DIVISION

Compression and injection moulding shops coupled with modern assembly and finishing units; Extrusion shops and a plastics bottle blowing department. Proprietary lines produced in this Division are:—

LACRINOID HOUSING FITMENTS
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LACRINOID & COLORTONE MEN'S BUTTONS
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VIETUM SHRINK SLEEVING AND COVERS
LACRINOID PLASTICS BOTTLES

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This Division specializes in the manufacture of plant and of media for modern barrel-finishing processes for the plastics and metal industries. It has its own physical laboratory, where samples can be processed, and is supported by a Technical Advisory Service.

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In the manufacture of refrigerator cabinet lids, Rubber Preforms, 1½ inches thick, weight four pounds each, required only fifteen minutes in the press after being preheated by G.E.C. High Frequency. Previously a curing time of 45 minutes was necessary. Write today for particulars of G.E.C. H.F. heating.

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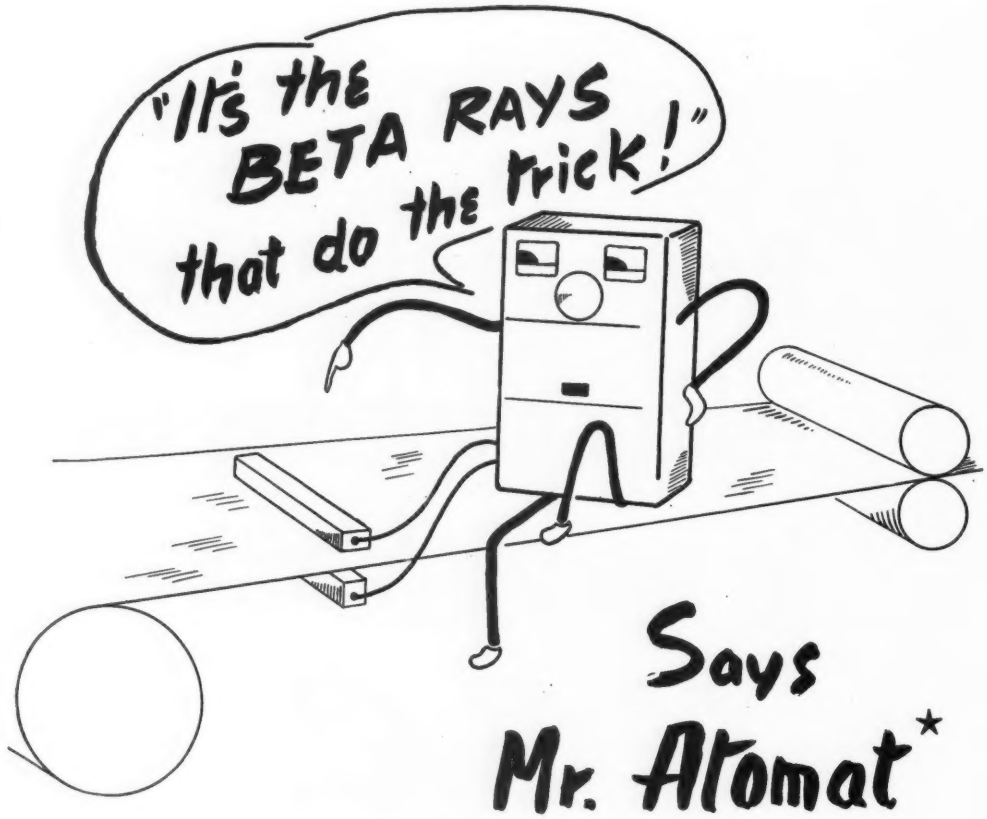

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I can operate recorders and give the alarm when your tolerance is exceeded.

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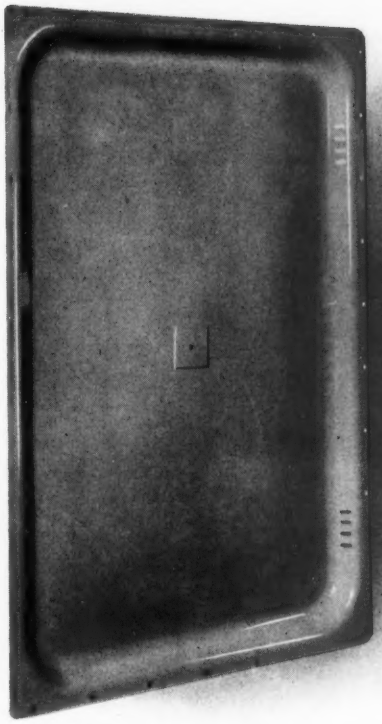
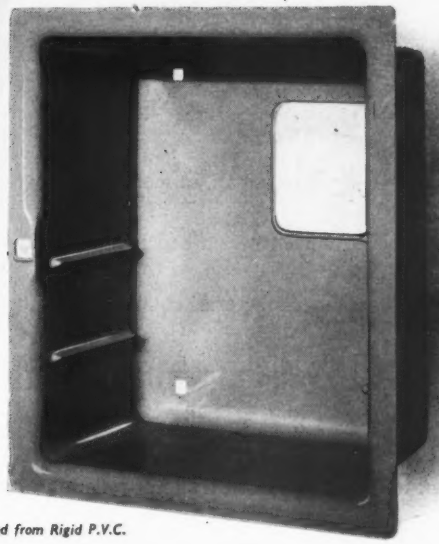


Inner door panel moulded from Copolymer Styrene materials



Complete interior lining moulded from Rigid P.V.C.

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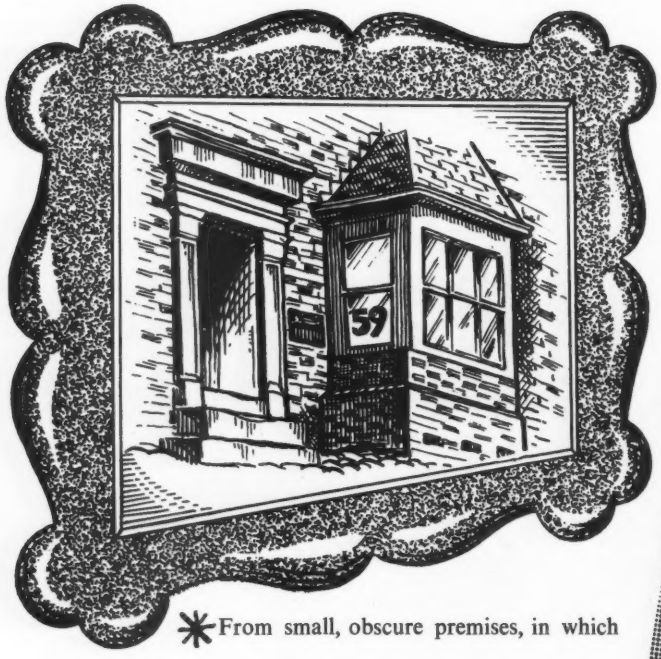
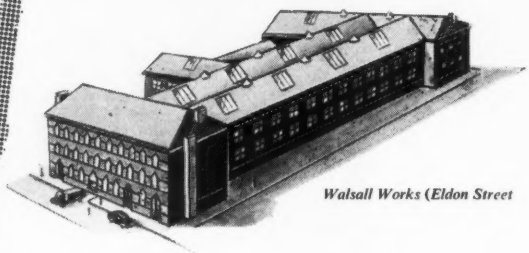
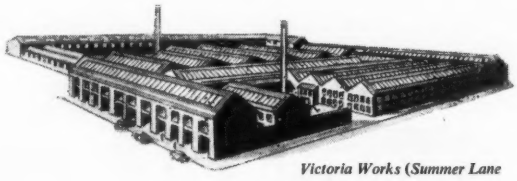


*It all started from Here

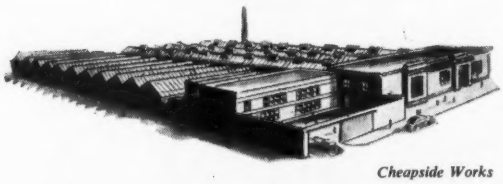
*From small, obscure premises, in which the sole equipment was a bench circular saw to four modern factories equipped with the latest moulding plant is indeed a far cry. We look back with a sense of achievement over the last thirty years and with an appreciation of the needs of our customers which has mainly been responsible for this development. If your problem is the production of large quantities of plastic mouldings by compression or injection we are waiting to help you.



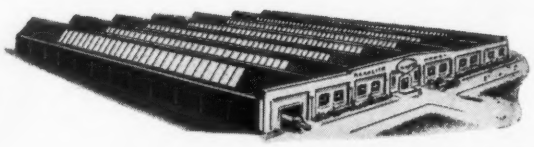
Walsall Works (Eldon Street



Victoria Works (Summer Lane



Cheapside Works

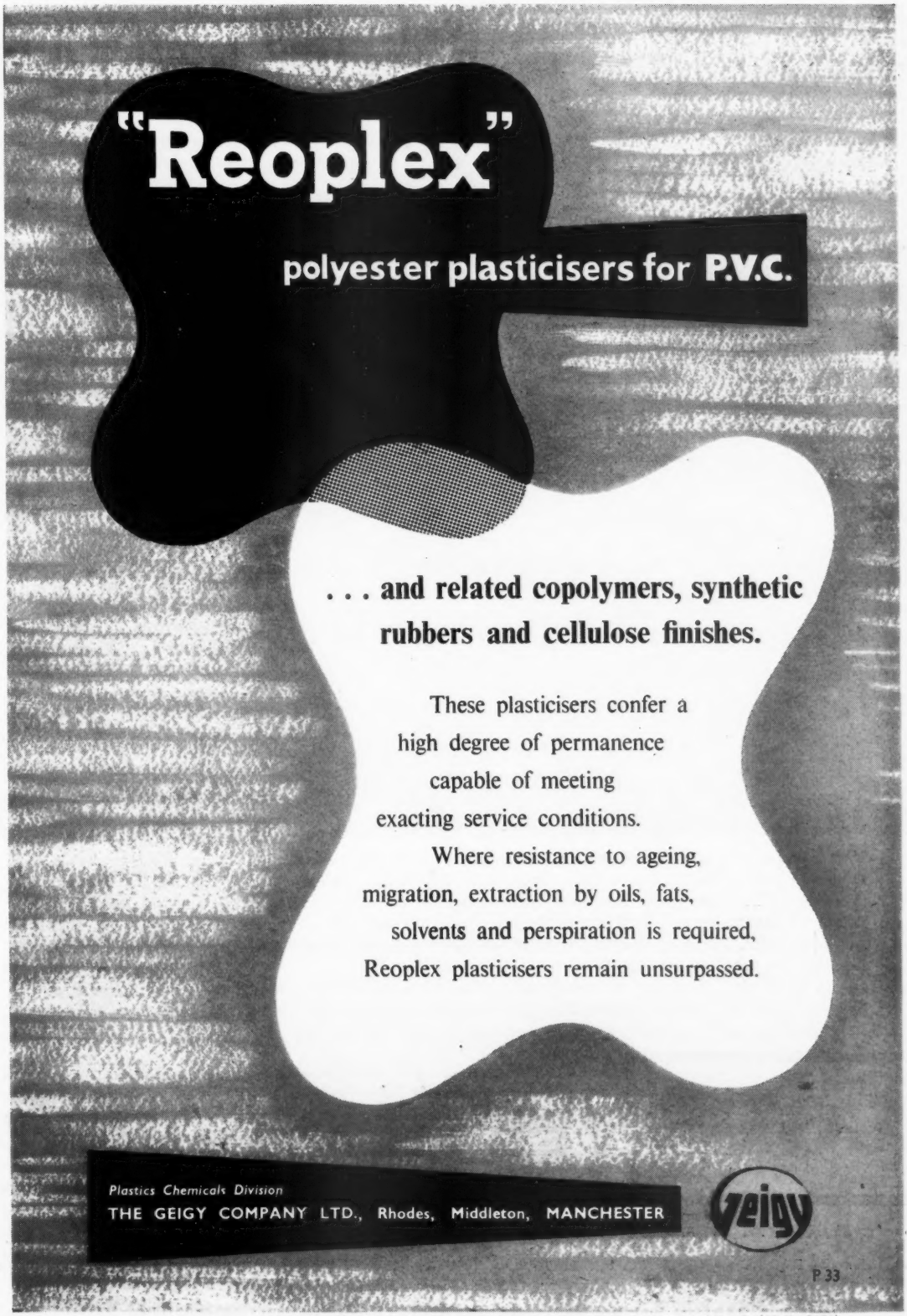


Walsall Works (Bescott Crescent)

E. Elliott LIMITED

315 SUMMER LANE, BIRMINGHAM, 19 Tel.: Aston Cross 1156-7-8-9

The plastic moulders with the Engineering background!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Geigy
P 33

44 factories at HARLOW New Town all ventilated by COLT

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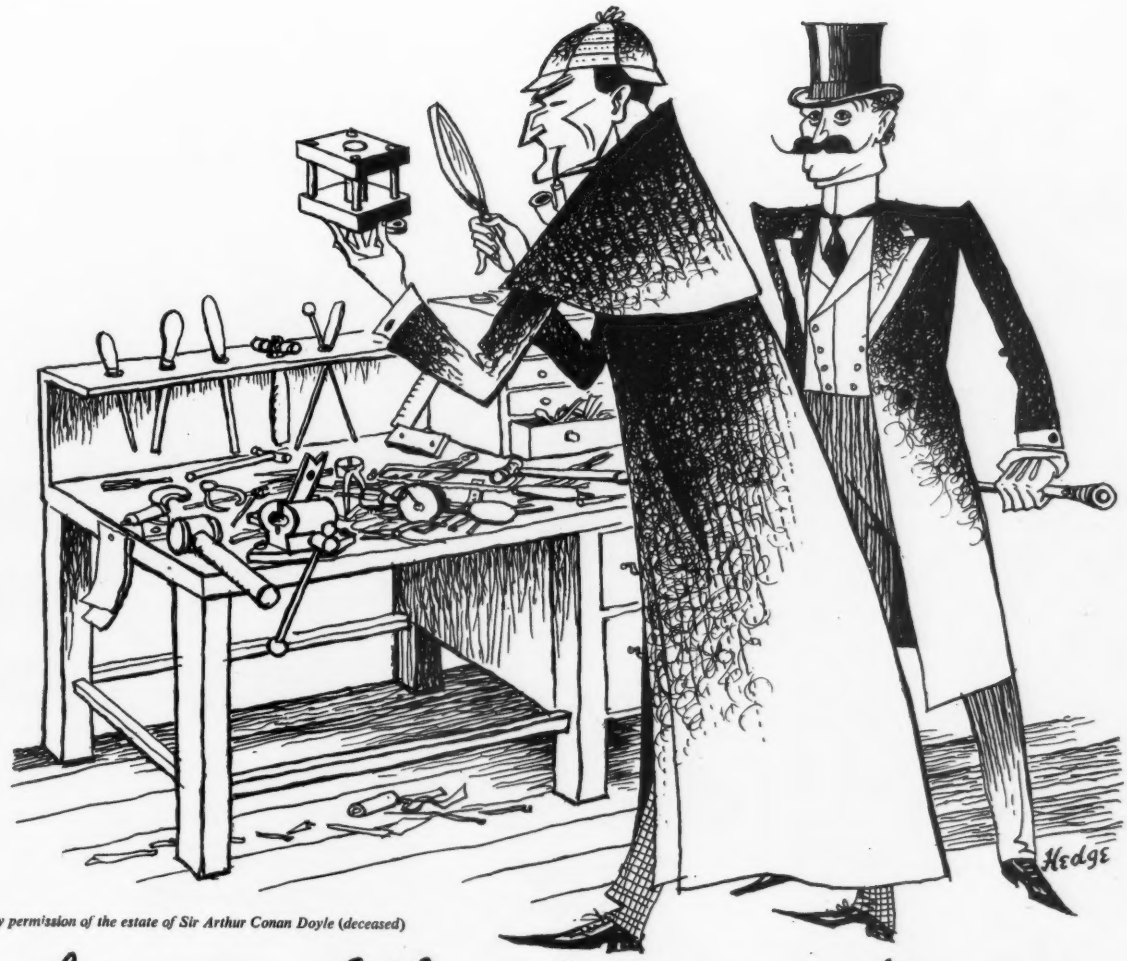

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the case of the missing craftsman..

"The man obviously has skill of a high order, my dear Watson . . . of a high order. He has obviously gone to a good firm, where craftsmanship counts. Come, Watson, to Mitcham . . . to Mitcham!"

At Mitcham, at Universal Tools, craftsmen of mature skill are assured of a welcome. Supported by up-to-date machines, encouraged by good design, and intelligently directed, here men can use their hands and brains to full advantage. The results are plastic moulds, press tools, jigs and fixtures second to none — tools that not only produce fine products quickly, but lower production costs also.

"And that, my dear Watson, is worth going to Mitcham for!"

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This refrigerator tray in Polystyrene material is a typical example of the large variety of mouldings made by the G.E.C.

moulded plastics for industry

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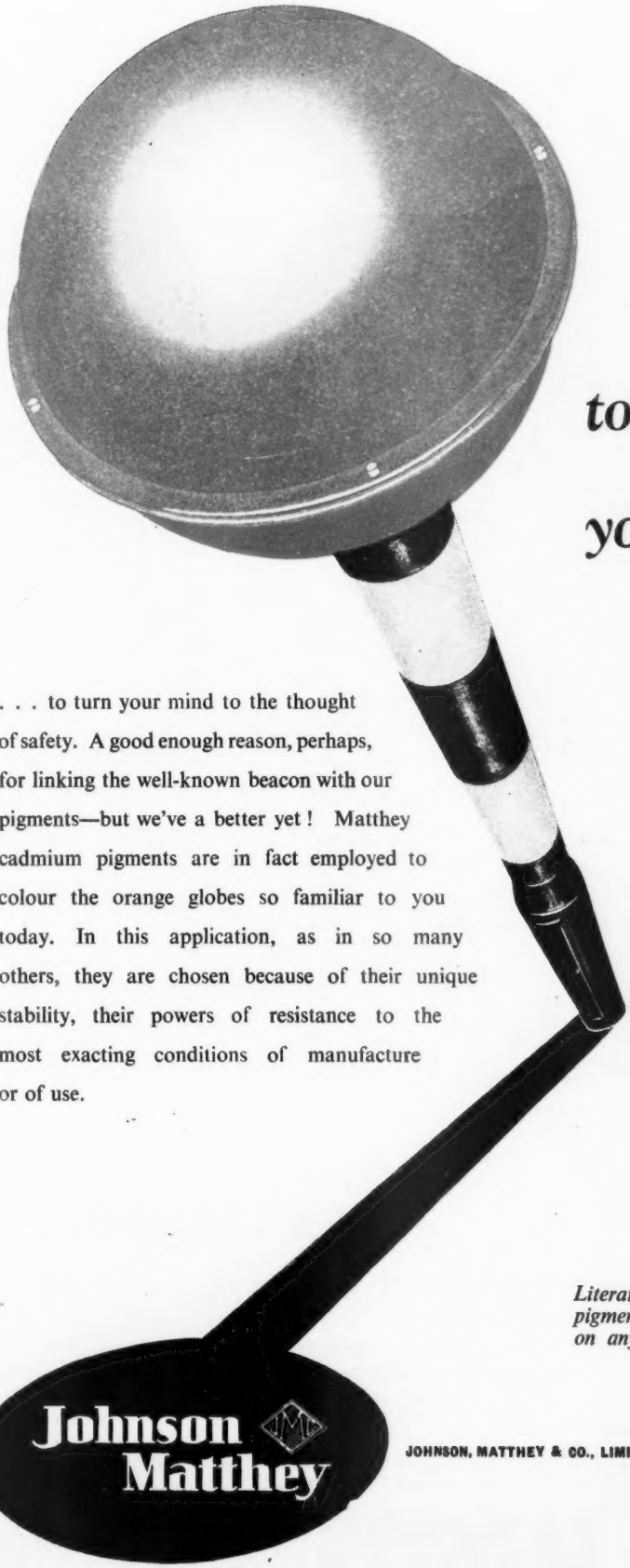

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. . . to turn your mind to the thought of safety. A good enough reason, perhaps, for linking the well-known beacon with our pigments—but we've a better yet! Matthey cadmium pigments are in fact employed to colour the orange globes so familiar to you today. In this application, as in so many others, they are chosen because of their unique stability, their powers of resistance to the most exacting conditions of manufacture or of use.

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Johnson Matthey

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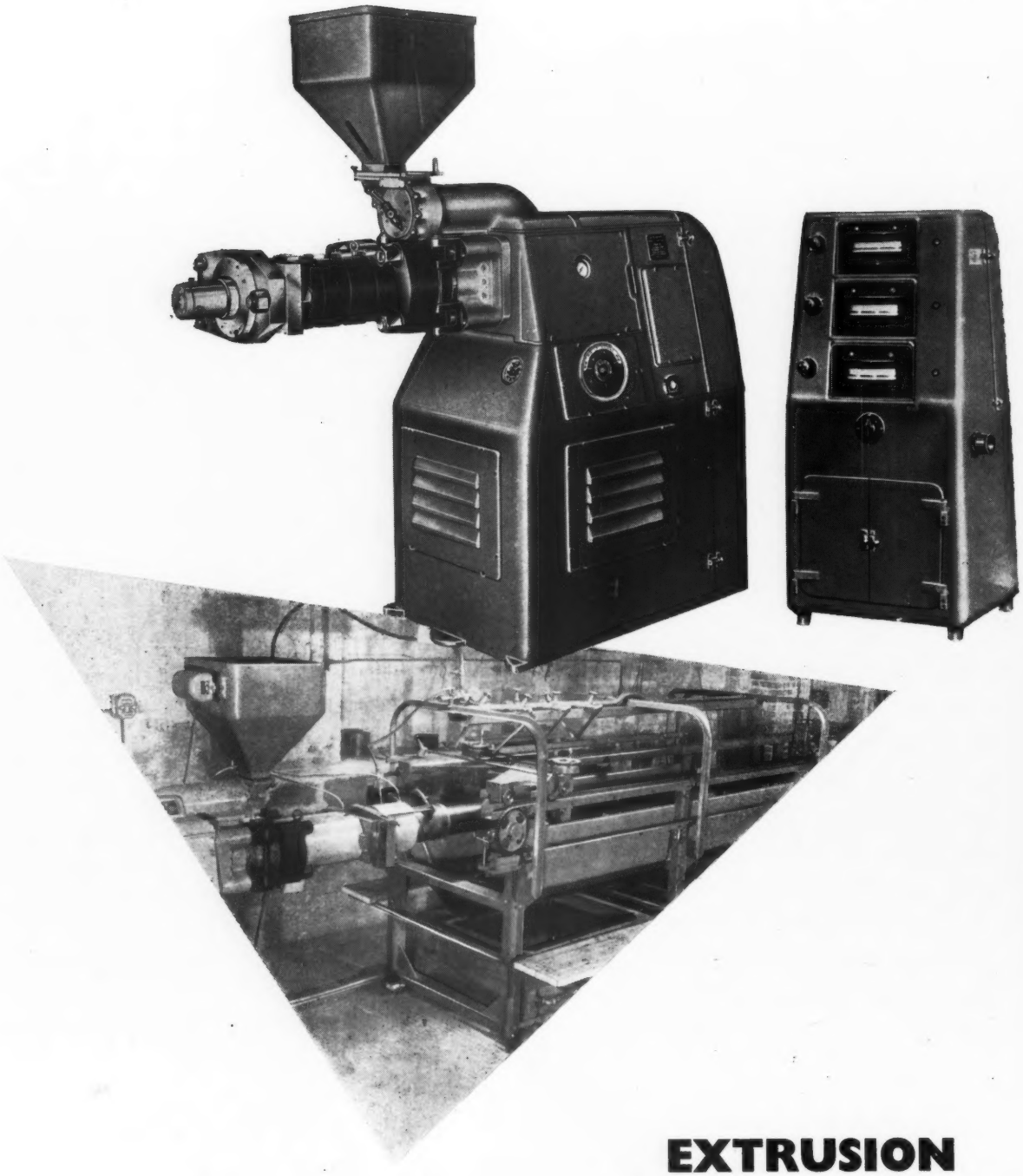

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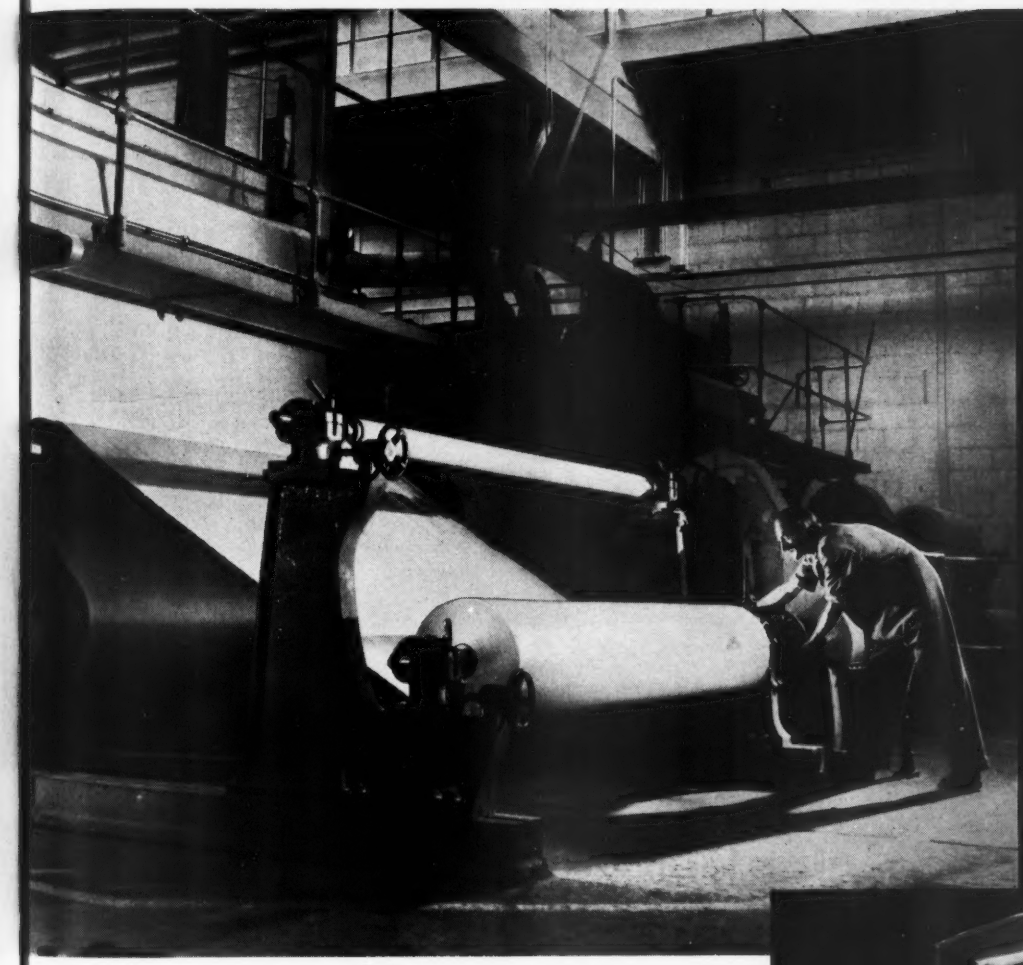
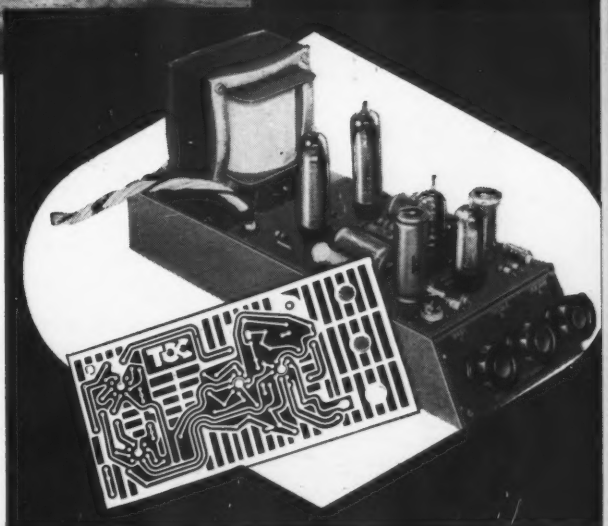


Different properties of BAKELITE *Laminated are emphasised in manufacture by varying the base materials. Asbestos, for example, increases heat resistance, fabric provides impact strength, and papers of various kinds are used for electrical insulation. In this photograph, paper is being reeled after passing through a large impregnator. It will subsequently be cut into sheets for laminating under heat and pressure.*

In the latest radio equipment, much conventional wiring has been eliminated and chassis assembly speeds have been doubled by using circuits etched on BAKELITE copper-surfaced Laminated Plastics. Circuits are made by printing the wiring diagram on the copper and then etching away unwanted areas. This method reduces the possibility of faulty connections, and facilitates the design of compact equipment. BAKELITE Laminated Material has many other important uses in the Radio, Electronics and Telephone Industries. Because of its excellent insulating properties and dimensional stability it is widely used for terminal strips, valve bases, parts of coils, transformers, condensers and many other components.

The original circuit for this high fidelity amplifier was designed by Mullards, and translated into a printed circuit by The Telegraph Condenser Company Ltd.



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First and still Foremost

Producers of **Bakelite** *Laminated Sheet, Rod & Tube ·* **Bakelite** *Glass Fibre & Asbestos Laminates ·* **Bakelite** *Phenolic, Urea, Alkyd & Silicone Moulding Materials ·* **Bakelite** *Polyester Resins ·* **Bakelite** *Phenolic & Urea Resins, Cements & Adhesives · Vybak PVC Moulding & Extrusion Compounds* **Vybak** *Rigid & Flexible PVC Sheet · Warerite Decorative Laminated Plastics*

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MODEL NUMBER	150-H-6	300-H-12	400-H-20	800-H-48
Capacity (oz.–Single Feed)	6	12	20	48
Capacity (oz.–Double Feed)	8	16	28	64
Material Injected (cu. in. per min.)	440	1035	1330	2895
Plasticizing Capacity (lbs. per hour)	60	100	135	350
Mould Clamp Capacity (tons)	150	300	400	800
Mould Space (hor. × vert.):				
(*a*) Full Platen Vert.	10½″ × 25″	16½″ × 33″	20½″ × 42″	36″ × 54″
(*b*) Full Platen Hor.	20½″ × 15″	30″ × 20″	36″ × 26½″	54″ × 36″
Daylight Opening without Ram Spacer	20″	30″	40″	55″
Daylight Opening with Ram Spacer	16″	26″	34″	47″
Mould Thickness without Ram Spacer	10″	10″	15″	20″
Mould Thickness with Ram Spacer	6″	6″	9″	12″
Clamp Travel (max.)	10″	20″	25″	35″
Motor Horse-power	20	40	50	100
Shipping Weight (pounds)	14500	22000	39000	75000

NOTE: All ratings based on moulding general purpose polystyrene

From 6 ounces to 400 ounces; with mould clamping pressures from 150 tons to 3,000 tons . . . that's the scope of the new H.P.M. range.

Each machine is new, designed with many outstanding features. High capacity plasticizing chambers, weigh feeders, greater 'shot' capacities, increased daylight and stroke, quiet pumps, and sub-plate mounted valves reducing piping to the absolute minimum, are some of the reasons why H.P.M.'s mould better, faster and at lower cost.

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Model 400-P48A Capacity 48 ounces.
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,, 3000-P400A ,, 400 ,,

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The answer? A beam of light: interrupted by the shutter on the camera. The magic eye counts the interruptions, electronic gear translates them into r.p.m.—as a direct reading on a dial. Eureka? But electronic speed measuring is **only one of the many aids to Productivity that electricity can bring you**

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E.D.A. are publishing a series of books on "Electricity and Productivity". Four titles are available at the moment; they deal with Higher Production, Lighting, Materials Handling, and Resistance Heating. The books are 8/6 each (9/- post free) and the Electricity Boards (or E.D.A. themselves) can supply you.

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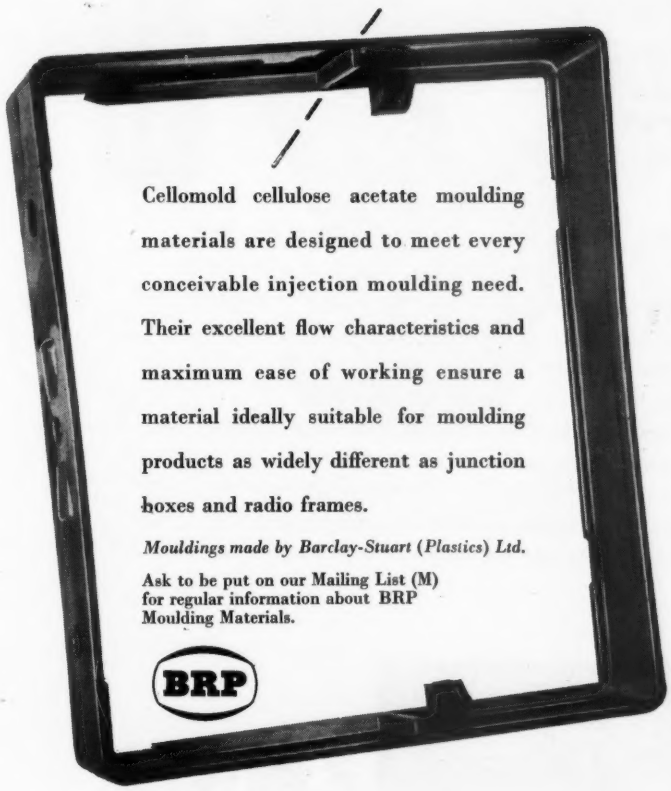

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BRP

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DURABLE · TOUGH AND STRONG

RIGID OR FLEXIBLE AS REQUIRED

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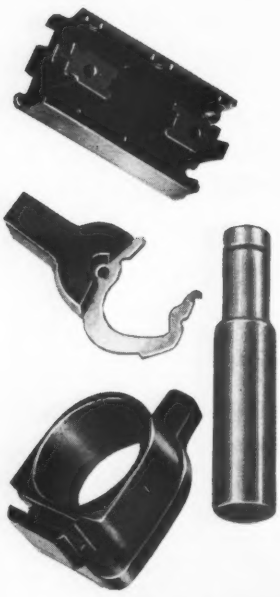

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Simple, streamlined, effective—altogether a pretty
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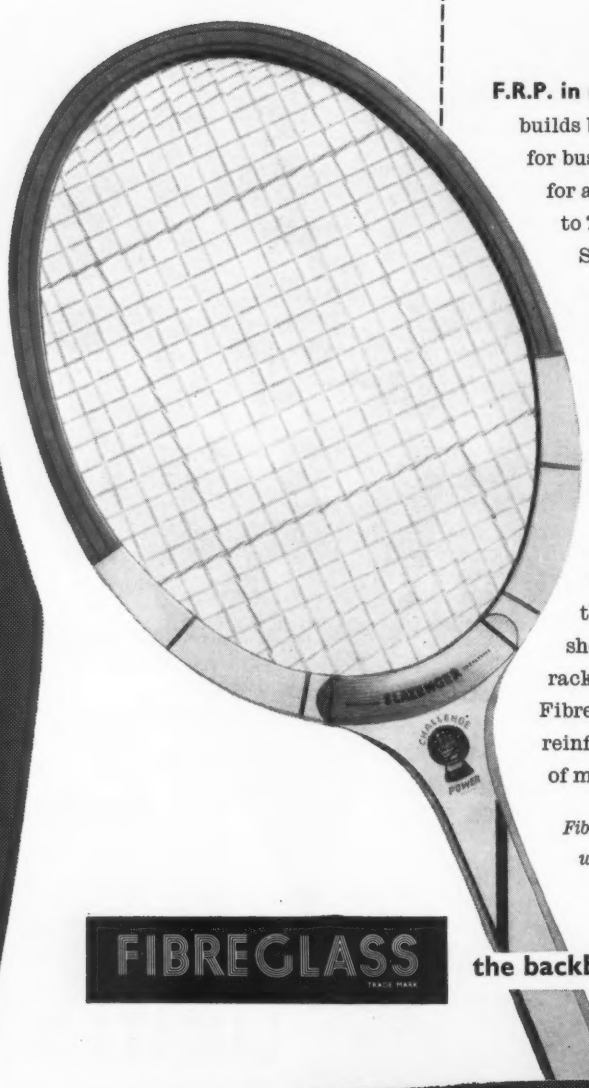
Moulding the future...



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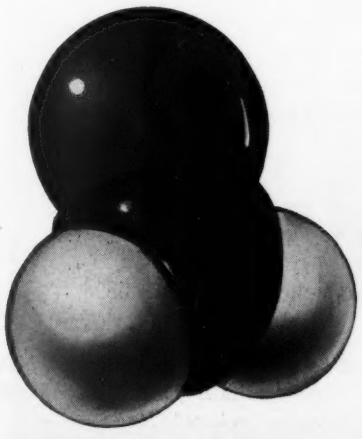

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TGA 61

Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

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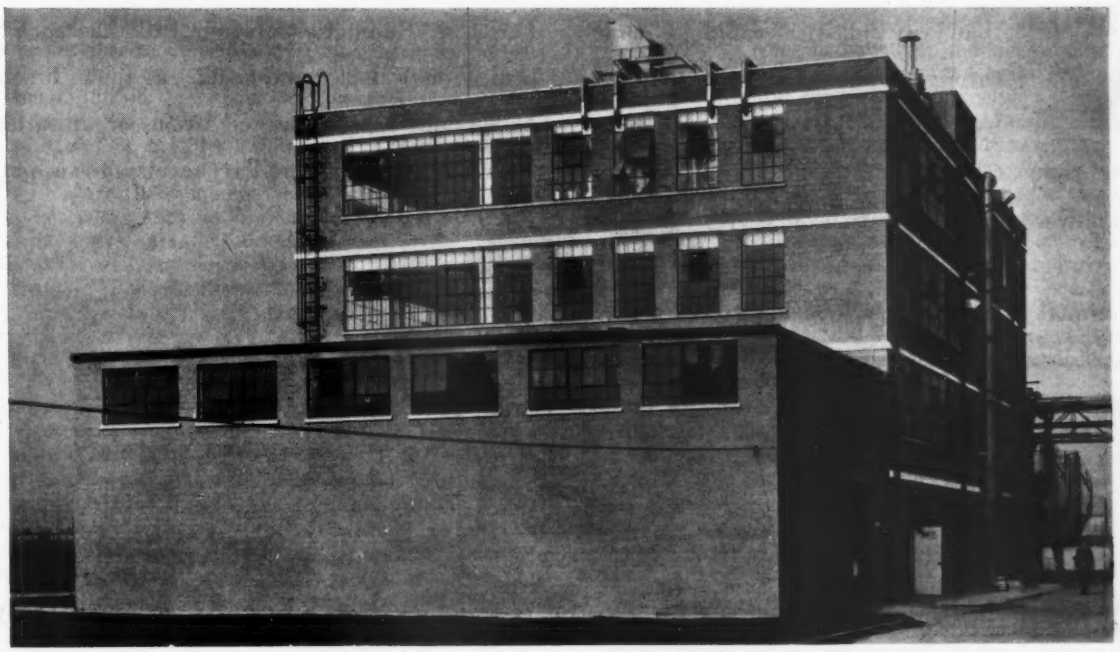

The new factory of Distrene, Ltd., in South Wales.

NP29

we'll say it's good

It is, perhaps, a little astonishing that any plastics cabinets come through the gruelling tests devised by radio manufacturers — but they do, thousands upon thousands of them. Significant, isn't it — that a very large proportion of all these thousands is made by National Plastics at Walthamstow where specialists have devoted their skill to this problem ever since plastics were first used to make radio cabinets. That's why this latest design by Ferguson Radio Corporation Ltd. has such a professional look and such a high finish. Experience counts, backed by an organisation with very extensive ancillary services to support the productive effort.

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Plastics

VOL. XX. No. 220 NOVEMBER, 1955

EDITORIALS

British and German Plastics Industries

THE disclosure in the early part of this year that German production of plastics had reached 350,000 tons in 1954, compared with our own 200,000 tons, showed clearly that Germany once again occupies the leading place in Europe in this field, and in proportion is not far behind the U.S.A. figure.

There is nothing to be despondent about on comparing these figures for if we go deeper into the matter we find our own rate of increase since 1938 has been impressive enough and, since the end of the war, even as spectacular as that of Germany when we consider that the histories of both nations in synthetic chemistry and in technology were so fundamentally different. Our future is full of brilliant possibilities if only we take advantage of the assets we have now built up.

Our history is largely a story of international trade created by a vast mercantile marine, and the development of our colonies trade with them and the Commonwealth that has grown up as a result. We thus developed the cotton and wool resources of the world, our own coal and iron primarily for shipbuilding and other heavy-engineering industries and a great coal export trade. We did not, however, carry out a comparable chemical study of coal and of the by-products that could be derived therefrom. We created a vast number of industries almost completely dependent on imports of rubber, metal, petroleum, vegetable oils and fats, and so on. We were indeed Napoleon's shopkeeper of the world, and for good or ill we regarded science in the middle of the 19th century as an interesting plaything, and technology, which should have followed it closely, only as an elementary mechanical education for the intelligent workman.

It is true that we created a great heavy chemical industry of acids, alkalis and fertilizers for the textile industries and agriculture, but in the organic field we made but hesitating progress. Parkes' discovery of celluloid in the 1870s gave us a lead in plastics, but Perkin's discovery of the first synthetic dyestuff and its manufacture eventually came to little as the basis of a great new industry, because of lack of support. Cross and Bevan's brilliant work on viscose resulted in world-wide interest in semi-synthetic fibres, but Greville William's discovery, in 1860, of the composition of natural rubber, and the methods of producing a synthetic rubber by Matthews and Strange in 1910, came to nought. Indeed, at that time, with natural rubber flowing into the country in ever-growing quantities, technical progress and its financial support could not be expected. In answer to this and other organic chemical projects, we could always point to the natural wealth of the world as being able to satisfy our needs.

Germany in the 15th and 16th centuries, as did the Venetian Republic before them, acted similarly—the Hanseatic League ruled much of the then known world and her ships sought raw materials everywhere, in the north, south and east. Our own conquests in the west gave us the chance to expand and Germany lost most of her advantages and gained no important colonies. By the 18th century overseas trade was largely in our hands. Germany turned to science and scientific and technical education fostered intensely by her rulers, and more specifically to chemistry and chemical technology, and so to synthesis. Her great chemists formed schools in specific branches, and the names of Liebig, Schonbein, Hoffmann, Kekulé, Emil Fischer, Liebermann, Kolbe, Haber and Willstätter were found in English organic chemical textbooks far more frequently than were names of any other nationality. At the same time, Germany fostered her technical high schools to a significant extent. And so, with few raw materials, especially metals, readily available her entry into synthetic resins was equally noteworthy, for her chemists saw the importance of the early synthetic rubbers they made during the 1914 War and pursued their search for polymers that would resist corrosion which could be used to construct chemical and industrial plant. By 1928 polystyrene and polyvinyl chloride were well established and a great new thermoplastic industry based on synthesis from benzol and acetylene, both derived from coal, began.

It has always taken major upheavals to stir British industry. In 1914 we had a negligible dyestuffs industry, for it had all been garnered by Germany. It took that war, and recognition of the dangerous situation, to create a British dyestuffs industry, which since has never looked back. In 1939 our plastics industry was based on home-manufactured phenolic and urea resins, celluloid, casein and polymethylmethacrylate —only a very few knew of a promising polymer called polythene that was about to come forth, and fewer still of any home-made polystyrene. Almost all cellulose acetate, polystyrene and polyvinyl chloride came from Germany. Again it took a war to develop them.

So here we are now in 1955 with a number of entirely new plastics factories as highly scientifically controlled as any in the world, in both thermosetting and thermoplastic fields. We also have now the beginnings of a great petro-chemical industry. It is true that in the thermoplastic field, with the exception of our polythene and Terylene plants which were entirely of British conception and construction, many of the factories are based on American practice. But no severe criticism can be levelled at those who made the decision, for the need was urgent, the factories had to be built quickly, the technology of large-scale production and know-how was generally lacking and had to be bought.

But what of the future of this potentially wonderful set-up? We lack our great organic chemical schools to develop new materials and we lack our trained technologists, physicists and engineers to develop scientifically the methods and machines we need to transform our plastics.

As yet, no energetic movement, indeed no co-operative movement at all, is visible to initiate such a desirable condition. Without it our industry will be sterile in mind and then sterile in body.

Düsseldorf Exhibition

WE publish in the following pages some notes on the Düsseldorf Plastics Exhibition held on October 8 to 16. From them, we have described the event in fair detail, we hope readers will understand some of the reasons for doing

so in the case of a foreign country that is our biggest competitor. We believe this has never been done before, but we have done so deliberately to bring to the notice not only of the British plastics industry as a whole, but also to other organizations and even to Governmental bodies who may be in the position to help our future, something of the differences between the actions and minds of the two countries.

The outstanding impression we obtained from the exhibition was a complete confirmation of the differences described in the preceding editorial. Fostered during the late 19th century the great German chemical industries grew with the aid of scientists and technologists, and the plant and machinery manufacturers acting with complete collaboration and accord, with a deep understanding of what it all meant to a nation without easy access to many raw materials with its great army of people, hard workers, and proud of their ability to work and produce high qualities, who understood the rôle plastics were to play between the wars and during the last war. Those who run and can read may look closely into the various three- and four-year plans evolved during the Hitlerian period.

Let us make no mistake. Germany never lost her plastics industry as the result of the war. Even had every factory been razed to the ground she would never have lost it. For knowledge in the brain of man cannot be destroyed, and in any event all scientific and technical details were written and preserved. Germany did not have to start all over again; the factories are the minor part of it—bricks and steel plant which can be built in a day or a year or five. We as a nation, did not have to begin *again*—we had to begin.

We can see the differences so easily in the greater variety of raw materials in Germany, in the greater variety and size of the half-finished material—compare sheet plastics—of the fineness of control in making them; of the variety of machines, their modernity and high production and the overwhelming advantages of collaboration between plant makers, users of the plant and raw material makers. All advances are, in truth, in concert.

If we had it in our hearts to forget the bitterness of the war years, even the ranks of Tuscany could scarce forbear to cheer this modern Horatius who has kept his bridge. It is up to us to begin building one. And this time with our own brains and hands. Let us stop being a nation of shopkeepers run by accountants.

Low-pressure Polythene

THE most important exhibits to the scientist and technologist and industrialist at the Exhibition were those made from the new low-pressure polythene discovered by Professor Ziegler in 1953. It is as yet being produced only on a pilot plant scale but by 1957 four plants will be working in Germany and several in the U.S.A. Shell Chemicals, Ltd., has the exclusive licence here and samples already produced in a pilot plant in this country, presumably at the Petro-chemicals factory, are said to be available. Another similar polythene has been produced in the U.S.A. by the Phillips process.

The important difference between the two main types refers to the different methods of manufacture—by high pressure and low pressure respectively, the former process (discovered by I.C.I. in 1933) resulting in marketed polythenes of relatively low molecular weight from between about 9,000 to 20,000, while the low-pressure method results in different ranges, the upper and so far marketed types being of 100,000, 500,000 and 1,000,000 molecular weight. Increase in molecular weight results in important improved properties: better resistance to higher temperatures, higher tensile and tear strengths, greater rigidity and better resistance to the permeability of gases.

At present it would appear that the new types carry on to a higher stage from where high-pressure polythene leaves off, and this is important enough, especially as regards higher temperature resistance to about 125° C. and greater rigidity, for the chemical factories and many other industries. Greater rigidity is obviously important for structural work, but in many fields we do not desire rigidity, e.g., the flexibility of piping for agricultural and other needs is an important property and piping for such purposes will be required to a greater extent than for any other. The advantages of each can be argued almost indefinitely. Ease of moulding in its various facets is another problem that will be important to the moulder. Research, production and application move in stages and roughly in compartments. Each new material has its own niche in which it is best suited.

By far the most important fact that appears on the polythene horizon, quite apart from which polythene is the " better," is the economic one that demand is increasing so rapidly that both types will be needed to fill the gaps and both types will be produced in growing quantities for a good number of years to come.

MOULDING POWDER AND SHOT

A False Premise

The Editor seems to have let himself go this month I see and has well and truly pushed me out of the picture—almost but not quite. However, as I said in our last issue, polyurethane foams are going big in the future. I saw two of the outstanding examples in this section of the Exhibition which must be Man's response to Woman's propensity for making mountains out of molehills.

◆ ◆ ◆

Erewhon Revisited (2nd Edit.)

Somewhere or other in his notes on the Düsseldorf Exhibition the Editor states that it was put up without a hitch and ready to look at in two days flat. Quite true, too, and, what is more, the show was open and crowded with visitors on Sunday of all days! Everybody was happy; buyers were buying and sellers were selling, translators were doing their stuff and technical representatives on the stands were really representing technically. I saw a prosperous-looking German gent with cigar in his mouth actually fitting a two-way switch over his stand with his own hands and gently humming the while, and on a second stand, another and his secretary changed the position of a table and two chairs! Nobody stopped them or shot them. In the afternoon I strolled outside to the river bank and the Rhine was the busiest river on a Sunday I have seen anywhere, a continuous stream of their great 1,000-ton barges, laden to the gunnels with coal, oil, acids and solvents, all going one way—south, to Cologne and Coblenz, to Mainz and Frankfurt and another continuous stream of barges in the opposite direction riding high and empty returning to the Ruhr, and the crews were only the captains and their wives and a few friendly helpers. Then it struck me in a flash! The word " work " had been abolished because nobody liked " work " (even the word had a nasty sound) so that there were no more " workers " and no more unions, for there were no more " workers " to unite. Instead, everybody made things because they liked making them and especially liked making money for doing so without let or hindrance. And so lots of things got done quickly and efficiently and without interfering with anybody else who wanted to do a lot of things also. Mr. Butler would have been pleased. No, fathead, *not* the Chancellor of the Exchequer, but Samuel.

DOGSBODDY.

Düsseldorf 1955

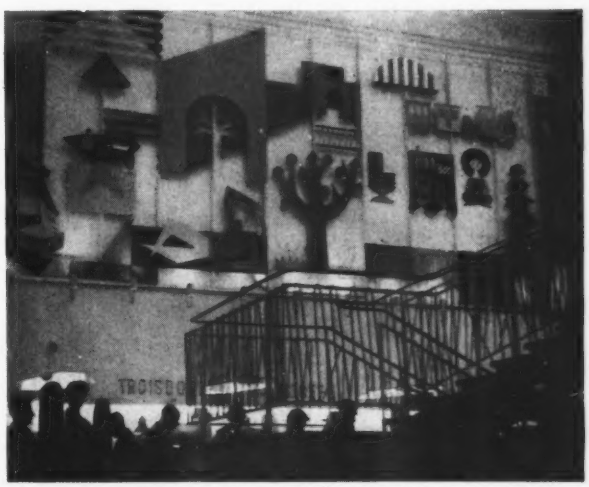
ON October 8 to 16, the Düsseldorf Exhibition, situated on the east bank of the Rhine, was the scene of a great influx of both native and overseas visitors. The Plastics Institute had arranged the visit of over 70 British members, but many more attended under their own devices.

Those who had visited the pre- and post-war Plastic Fair at Leipzig and the chemical-plant exhibitions (Achema) at Cologne and Frankfurt, in which plastics always took so important a part, and Düsseldorf in 1952, were no doubt prepared for the amazingly powerful propaganda that is always a feature of these shows, and also for the typical Germanic style of the stands common to all except a few. But the size, one can almost say vastness in breadth, depth and height, of so many displays was often overpowering in the visual effect, as was the predominant use of colour to an extent we have never seen before. The modern German designers had clearly been given a free hand, and they had used it and the whole gamut of the spectrum and beyond (u.v. light was also being used) with lavish energy. Nor were they stultified in their use of height. Whether one liked it or not, there was no doubt of the power behind it for transmitting the effect that was obviously intended.

Yet, on the whole, the stands (we refer here to the raw-material sections) were made simply, easily and probably quite cheaply—almost, one might say, by supporting vast sheets on scaffolding as back- and side-grounds. There was much for us to learn here, especially as there was generally an absence of the entirely closed (and costly) form common to British exhibitions. For what it is worth to our exhibition organizers and our trade unions, the whole Show was erected in two days, without hitch and with complete co-operation in all operations.

We were not quite prepared, however, for the vastness of the whole Exhibition, clearly, we believe, the largest devoted to plastics alone we have yet seen in any country. There were eight halls of various sizes, a few of which seemed nearly as large as the last British Plastics Exhibition. The Information Room (catalogues, Press, photographs and general news) in the first hall was itself larger than the big waiting room at Euston Station. The halls segregated the various sections and raw materials, special exhibits entitled "The Best Made from Plastics" and "From Material to Shape" occupied three halls. In this group there was also the pleasing inclusion of "user" stands.

At this point we may mention that the number of exhibitors was more than 340, a goodly number being that type of "user" company, i.e. in the furniture or raincoat or bag industry, that are never seen in a British plastics exhibition. This emphasized the extraordinary co-operation that has taken place to make this Show the success it obviously has been. Since in this introduction we are seeking distinctions with our own shows and anything that will help us to improve them, Düsseldorf, and especially the Exhibition itself, is in a fortunate position in being where it is. The town is, if not beautiful, exceptionally clean with broad streets, and is amply supplied with spacious gardens. Above all, it is on the Rhine which, with flat banks on either side at this point, is almost



The stand of Dynamit A. G., demonstrating the size of individual displays.

Glass-reinforced bath and barrel, shown by Reichold Chemie.

as pleasant as the Battersea-to-Kew reach. The Exhibition was completely free of the so-called refreshment bar common to Earls Court and Olympia, and while there are five small restaurants within and an adequate coffee room, the restaurant facilities on the riverside and elsewhere are (while too crowded in Exhibition time) numerous, immense and comfortable.

The Exhibition was organized by the five German Trade Associations: The German Federation, The Processing Association, Plastics Producing Association, Manufacturers of Machinery Association, Association of Manufacturers of Cutting and Punching Tools, and was carried out by the well-known Nowea publicity organization.

Raw Material and Moulded Goods

To give a preliminary indication of the number of raw materials made and the number of manufacturers making them, we give the following, listed as such in the catalogue. Doubtless there are others in the country that did not exhibit: Aldehyde resins (1), casein (2), cast resins (6), celluloid (4), cellulose acetate (4), cellulose acetate-butyrate (4), cold-moulding compounds (1), epoxy resins (2), ketone resins (2), phenolic resins (15), polyamides (4), polyesters (13), polyethylene (4+), polystyrene (7), polyvinyl chloride (7), polyvinyl acetate (5), polyurethanes (5), synthetic rubbers (3), urea resins (5).

It has already been noted in an editorial in this issue that the Germans have built up their industry with an eye to the use of plastics in all industries and, above all, to the chemical industry, for it is there that metals can be most readily replaced by the outstanding characteristic of plastics—resistance to corrosion. It was not surprising, therefore, to find so much stress laid on the production of piping, tanks, fans, reaction vessels, hoods and ducting, pumps and valves, fabricated from extrusions, welded sheeting or corrosion resistance effected by spraying with polythene, p.v.c., epoxy resins, phenolic resins, and so on.

There were surprisingly few examples of work, other than some tanks, made from glass fibre laminates. The Mannesmann Tube Co., who are interested in such tubes, were not exhibiting. Britain's entry into this field is strong, especially in the oilfields of the Near East.

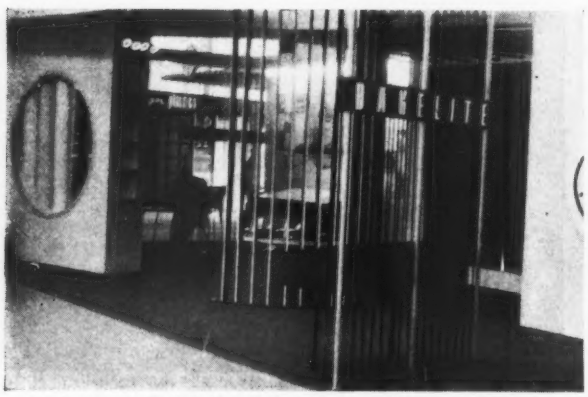
Ziegler Polythene

Most of the technical and scientific visitors had one primary urge—to learn something about the Ziegler polythene and to see examples of extrusions and mouldings made from it. Recent information states that this new material, made by low-pressure methods as compared with the high-pressure I.C.I. process, is to be made in Germany by four well-known companies: Hoechst, Ruhrchemie, Huls and Hibernia. As with many other polymer factories, the suitable unit of manufacture for each factory appears to be 5,000 tons by 1956-57. It is hoped to increase the production of each to 20,000 by 1960-61, so that it is presumed a total production of 80,000 tons will be aimed at in Germany by the latter period.

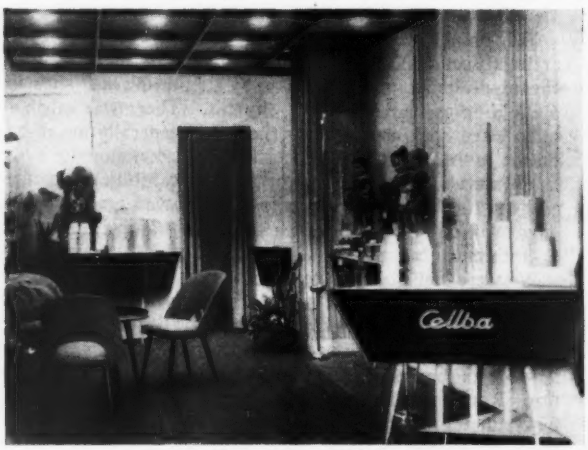
The following information obtained from Ruhrchemie, one of the licensed manufacturers, may be taken as general.

Although any molecular weight from 20,000 to over 1,000,000 can be produced, three types of average molecular weight, 100,000, 500,000 and 1,000,000, are at present the chief products. All exhibit greater hardness, improved strength and increased heat resistance as compared with lower molecular-weight polythenes.

In apparently all cases, resistance to attack by most acids and alkalis is as complete as normal polythene, while to oils, chlorinated solvents and ring compounds it is progressively greater with increase in molecular weight. Permeability of oxygen, hydrogen and carbon dioxide is less than that for high-pressure polythene, but of the essential oils is still probably too high for acceptance. The processing includes extrusion (high molecular-weight powders need pre-plasticization) with moulding temperatures for granules of 70° C.-300° C. at the nozzle and 250° C.-350° C. at the head, depending on molecular weight, shape, etc., injection

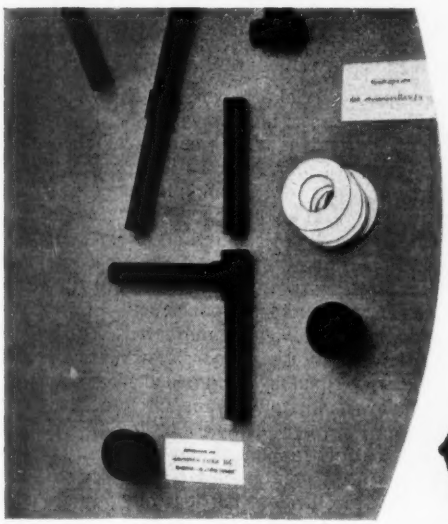


A view of the Bakelite stand, indicative of the type of stand construction employed.



Mouldings shown by Cellba.

(Below) Pipes, gaskets and couplings in low-pressure polythene, shown by Ruhrchemie.

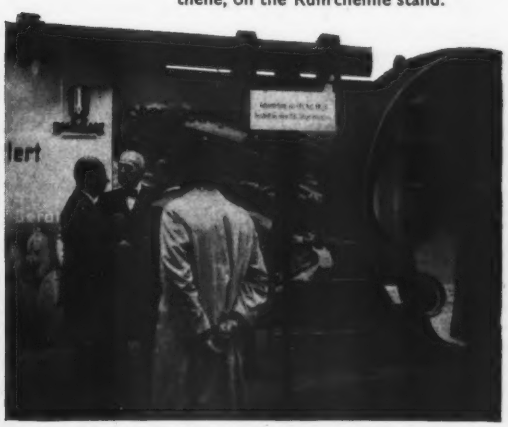


(Below) Polyester/glass fibre suitcase by Schorch.

(Left) Glass-reinforced car body, shown by Bayer.

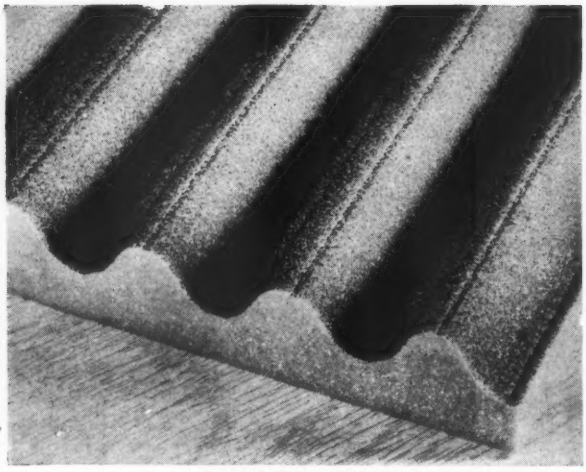
(Below) Another glass/polyester body, built and shown by Adloff-Plastic.

(Above) Buckets in low-pressure polythene, on the Ruhrchemie stand.



(Above) Chemical plant in glass fibre, phenolic asbestos, and p.v.c.

(Left) Children's paddling pool by Schorch, in p.v.c.



Foamed Polyurethane

moulding, compression, and transfer moulding. The new polythenes may also be flame-sprayed or sintered.

Table 1—Mechanical Properties

	Dimension	Polythene 100	500	1,000	Test Method
Specific Gravity of Powder	gm./cm.³		.96		Picnometer
Bulk Weight of Powder	gm./litre		240		DIN 53-468
Specific Gravity of Processed Material	gm./cm.³		.935		Picnometer
Tensile Strength, 20°C. at upper yield	kg./cm.²	230	230	230	DIN 53-371 (Tentative)
Tear Resistance	kg./cm.²	380	410	470	(Tentative)
Elongation at break	%	1,300	800	450	(Tentative)
Youngs Modulus			4,500		(Tentative)
Shear Strength	kg./cm.²	250	320	390	ASTM D 732-46
Stiffness	kg./cm.²		300		DIN 53-452
Impact Bending Test			no rupture		DIN 53-453
Shore Hardness (D Scale)		70	72	74	DIN 53-505
Abrasion	mm.³	75	102	149	DIN 53-516

Table 2—Thermal Properties

	Polyethylene 100	500	1,000	Test Method
Expansion Coefficient cub. at 20°C.		1.10^{-4}		ASTM D 864-45T
Maximum Service Temperature °C	125	130	135	
Low Temperature Properties;				
Notch Sensitivity Temperature °C.	−20	−50	−70	ASTM D 864-45T
Brittleness Temperature °C.	−100	below −140	below −140	ASTM D 864-45T
Specific Heat at 20°C. cal./kg. °C.		0 55		
Thermal Conductivity cal/m hr. °C.		0.35		

The processed piping shown drew much attention, since its use is extended for many purposes in the chemical industry for liquids at temperatures much greater than has been possible hitherto. Bursting strength has increased. Thus, the short-time bursting pressures (2 minutes) at 20°, 50° and 80° of a 1-in. pipe of 4-mm. wall made from 500,000 mol. wt. polythene are given as 80, 50 and 25 kg./cm.² respectively.

Table 3—Electrical and Optical Properties

	Dimension	RCH-Polyethylene	Test Method
Specific Resistance	Ω c.m.	$>10^{15}$	DIN 53-482
Surface Resistivity	Ω	$>10^{13}$	DIN 53-482
Breakdown Voltage	kv/mm.	50	DIN 53-481
Dielectric Constant		2.2	DIN 53-483
Power Factor at 10^3-10^6 Hertz		$2 \cdot 3.10^4$	DIN 53-483
Refractive Index		1.534	Microscope
Transparency*		70	Photometer

* Measured for white light; layer depth 0.1 mm.

Interesting exhibits of injection-moulded l.p. polythene included gearwheels running against steel gearwheels, textile pickers after a long period of use, and sintered blocks of various low specific gravities for use in insulation. An interesting exhibit on the Ruhrchemie stand was the continuous subjection to boiling calcium chloride solution at 125° C. of a low-pressure polythene bottle.

Foamed Plastics

As with polythene, a big splash, and deservedly so, was made with the comparatively new expanded polystyrenes and polyurethanes. These foamed bodies, while they find their main use in packaging and in the home for a bewildering range of articles, appeared on the stands of a large number of firms who carry out their own foaming in many ingenious ways. This section lent great colour to the Exhibition. While the styrene material, because of its stiffness, seemed somewhat limited, the production of pure white cast boxes and containers in all shapes for holding presentation wine or perfume bottles was noted. The polyurethane foams, with their variety in softness, hardness and lovely colours, were applied to the production of clothes brushes, floor brooms, containers, bath mats and carpet underlays, moulded packages for valuable goods, pillows, window cleaners, clothes-hangers, and so on.

There is a good deal of truth in the presumption that the number of moulders and fabricators in Germany is not much greater than that in Great Britain, but it is obviously a fact, because of the reasons already stressed, that the greater production is due more to the higher use of plastics per head in Germany and to 10,000,000 more population, than to greater exports. The method of growth, via primary "testing" in the chemical and other industries has resulted in high standards and her production of electrical and general mouldings is of as high a quality as our own. In the phenolic field this has always been so, and we well remember seeing at a Leipzig fair, the superb work carried out on one of the completely automatic compression machines of the C. and W. Berges Company of Marienheide, Rhineland. This was in 1938, and we still possess a simple ashtray made on it; its superb finish seems to have changed no whit after 17 years of use. We were pleased to see this company again at Düsseldorf. Another stand that drew our attention for superb work, was that of Rheinisches Spritzgusswerke. We have seen equally good work done here with polystyrene, cellulose acetate and butyrate and with nylon, for medium electrical units, tiny electrical hearing aids, etc., but this stand won high marks in intelligence of layout—at first sight it seemed an exhibit of precious jewels or other ornaments.

Rohm and Haas, the makers of Plexiglas, had erected a

A bottle, moulded in low pressure polythene, is shown here on the stand of Ruhrchemie, in calcium chloride solution at 125° C.

P.V.C. sheet used in chair covering.

rather stupendous show—a complete stairway to an upper floor to show this material's strength, a fantastic fountain to show resistance to water, and a continuously moving vertical bucket conveyor carrying a heavy steel ball to be dropped on to a huge plate to show resistance to impact. Since every component in this well-known methacrylate resin was transparent the show was very impressive.

Of special interest to us, with so much concentration throughout the world on vacuum forming, was the development in sheet p.v.c., polystyrene and mixed polymers, not only in dimensional control but also in size of sheet. The Rheinisebe Gummi and Celluloid Company showed some excellent examples as did several other companies. The wide range of films in p.v.c. polythene, polyamide and in " our " own Terylene was noteworthy.

The German plastics industry seems to be at the same stage of glass-fibre laminate construction as ourselves—that of indecision; at least the number of stands which showed samples was small although it appears that some 20 companies make polyesters, epoxy resins and silicones as binders. There were two or three motorcars made of it, and a motor boat, but little else, although most of the Reichold Chemie stand was taken up with a bath, a barrel, and kitchen sink (perhaps it was a " photographic " sink). Whether these were serious products or " just to show what we can do " we could not discover. We saw very little tube work and no caravan construction, both of which appear to be sound economic jobs in this country.

Of course, Germany, like France, has gone " full out " on p.v.c. for furniture covers; the designs and styles and surfacings are something very worth while seeing. A most fascinating form which we had seen a year or so ago in France was the " suède " type. The Alkor Company exhibited some of the most delicately beautiful coverings with this on chairs and other furniture we have yet seen. Both in design and this plain material it is clear that the Germans are aiming for the discerning and not, as we do generally, for the cheaper trades.

One attribute which seems common to both countries, thank goodness, is the low production of the completely pointless and shoddy—the making to get rid of a certain unwanted colour or quality at such low prices that some sections of the public cannot refuse to buy. In one section we thought at first sight we had come across a strong case of " usefulness " but we were in error, for on closer examination it was clearly a display to bring home such qualities as attractive colour, lightness, resistance to water and so on. This display was in one of the huge instructional shows independent of the normal exhibitors' stands. Entitled, " Plastics in the Garden and Open Air," a large grass sward was peppered with small and large " pantomime " flowers cut out of delicately coloured foamed polyurethane sheet. Coloured or otherwise decorated chairs and tables, tents with transparent p.v.c. windows, and in the middle a huge pool of water on which floated a 6-ft. yellow square of the foamed material and on it were placed cups and saucers and other impedimenta for children to amuse themselves with. Another floating raft had a p.v.c. window for them to look into the depths of the ocean.

In another of these sections were exhibits of the " Plastics in the Home " type—more or less complete bedrooms, sitting rooms and kitchens of plastics, including " wallpaper," flooring and floor tiles, steel tubes and banisters covered with " shrunk-on " p.v.c., polymethacrylate screens for creating a small room in a large one with a long flower box against the plastic for decoration and separation, decorated table ware, panelled pillars, piping in the kitchen, laminated table tops, " foam " stuffed chairs covered with p.v.c. and so on, almost without end.

We hope from the above descriptions and the photographs we publish that readers will agree with us that we have something to learn in the matter of showing our own medals.

Visitors to Düsseldorf interested in a polyester/glass fibre speed boat.

A fountain in Plexiglas, on the stand at Röhm and Haas.

PLANT AND EQUIPMENT AT DÜSSELDORF

THE impact of the machinery section at Düsseldorf was formidable if only because of its size; for injection moulding and extrusion the total number of companies exhibiting plant and equipment was over 44, illustrating the prosperity of the German machinery manufacturer who is apparently finding a wide market for his equipment both at home and abroad.

In this report it is possible to deal only briefly with the major developments of note but there should be sufficient indication of the tremendous effort which Western Germany has made to bring its moulding and fabricating equipment to the forefront. Pre-eminent in the German sales policy is speedy delivery and comprehensive after-sales service. Whilst the plant at its best is no better than Britain's best, the choice is certainly far greater.

If one may refer to a highlight in connection with the exhibition at Düsseldorf it would undoubtedly be the vacuum forming equipment which was shown. The most notable absence was compression moulding equipment. It would be true to say, however, that the compression moulding industry has by no means diminished in importance although there is a natural interest in new injection moulding plant on a far greater scale.

In the injection moulding field two English companies were represented, **R. H. Windsor, Ltd.,** and **The Projectile and Engineering Co., Ltd.** Peco, who have recently announced the completion of the largest injection machine to be built outside the U.S.A. (see pages 386 and 387 of this issue) reported very favourable inquiries by moulders in Germany and also from visitors from other countries. The machine shown was the 8-oz. unit, from which the 160-oz. machine takes its general pattern. Also on display was the 4-oz. machine. Full details of this were published in the March, 1954, issue of *Plastics*, pages 96-98.

One of the most interesting features on display was a larger edition of the popular Autoplas injection moulding machine manufactured by **R. H. Windsor, Ltd.**

Destined for the factory of a prominent German industrialist, the new Autoplas model 20/88, with a single-shot capacity of 54 ounces of polystyrene, invoked great interest among all types of viewers.

Also displayed on the Windsor stand was their versatile model S.H.4 machine, producing a four-impression container cap in polystyrene, and a Windsor fully automatic 1-oz. machine producing a heavy section acrylic moulding.

Albert Stübbe offered for sale machines of 2, 3, 5, 7, and 10 oz. capacity, all of similar design. It is true to say however that the Stübbe stand was one of the most interesting in the injection moulding field at the exhibition since the company has investigated thoroughly the possible variations in production techniques that may be carried out by purchasers of its machines.

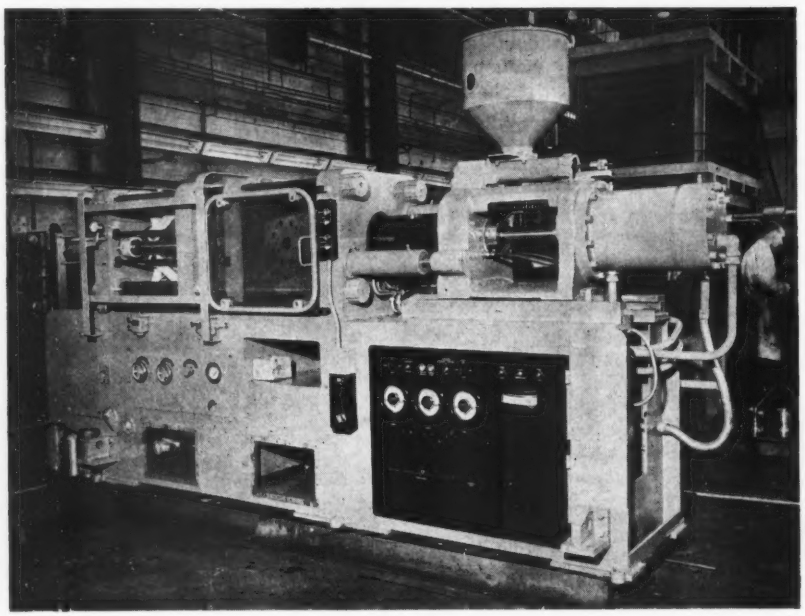
Each machine is available in four models: Model M is hand lever operated and must be connected to a separate source of hydraulic pressure. Model ME is hand lever operated with built-in hydraulic pump. Model V is fully automatic, and can be run semi-automatically or manually if desired and must be connected to a separate series of hydraulic pressures. Model VE is identical to Model V but has a built-in hydraulic unit.

Although the conception of running an injection moulding plant on an accumulator system is probably by no means new, Stübbe have fostered sufficient interest in this method of approach to offer a range of machines specially constructed for the purpose. The advantages may be summarized as follows: The individual machines are very much cheaper initially in the absence of self-contained hydraulic equipment, they are cheaper to maintain and there can be greater efficiency in operating by the installation of a single hydraulic unit to serve, for example, six machines. In this connection we would refer the reader to the July issue of *Plastics*, where in an editorial the approach of German machinery manufacture towards the injection moulding machine was discussed in some detail. It was certainly apparent at Düsseldorf that the smaller capacity machine is in favour, in the range from 2 to 10 oz. and that the large machine, 16 oz. and over, is by no means as popular as is the case in Great Britain.

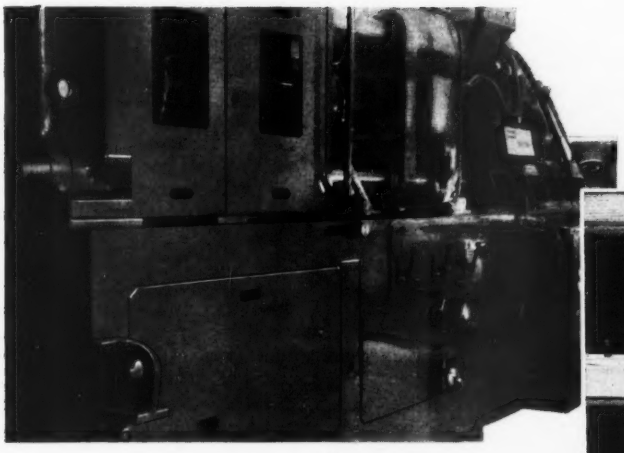
To take a typical example of the Stübbe range, model H450, with a plasticizing capacity per hour of 70 lb. gives a maximum moulding area of 156 sq. in. The number of shots per hour is 90, and the mould closing pressure 350 tons. The injection plunger has a stroke of 11¾ in. and the temperature range is from 0° to 350° C. This machine is rated, with a piston diameter of 2¾ in., to deliver mouldings of up to 10 oz. in polystyrene, 11½ oz. in polyamides, 5¼ oz. in polythene, and 10 oz. in acrylics. This offers a high level in productivity resulting from considerable ingenuity in machine design. The toggle linkage in this case is of the double or four link type, giving a greater effective clamping pressure.

It will be interesting to see what developments emerge in Germany from the use of the single accumulator system for serving a battery of such injection presses.

Eckert and Ziegler have also investigated the possibility of operating injection moulding machines in groups by means of one hydraulic supply system. The 1½-oz. machine with the series number

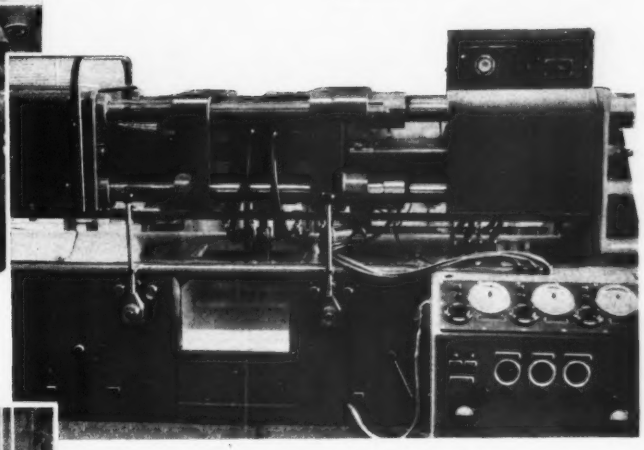


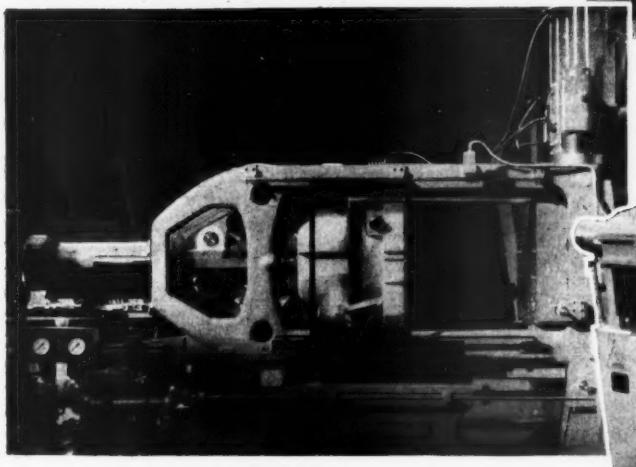
General view of 4/6-oz. machine, taken during assembly at Peco's Battersea works.



(Above) "Autoplas" machine on stand of R. H. Windsor Ltd.

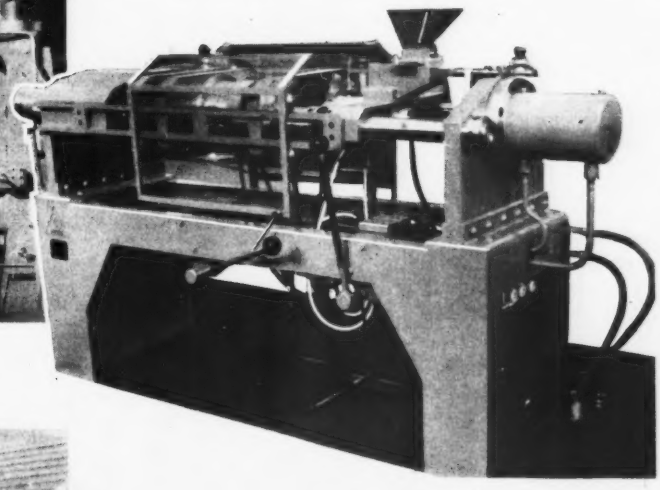
(Below) Albert Stübbe injection moulding machine.

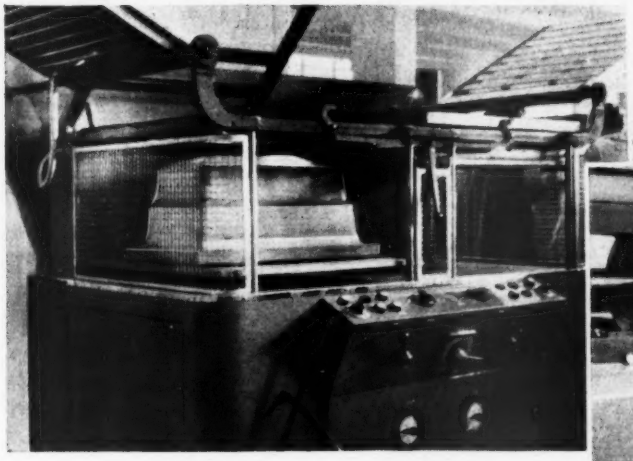




(Above) Close-up of locking mechanism on the Weingarten press.

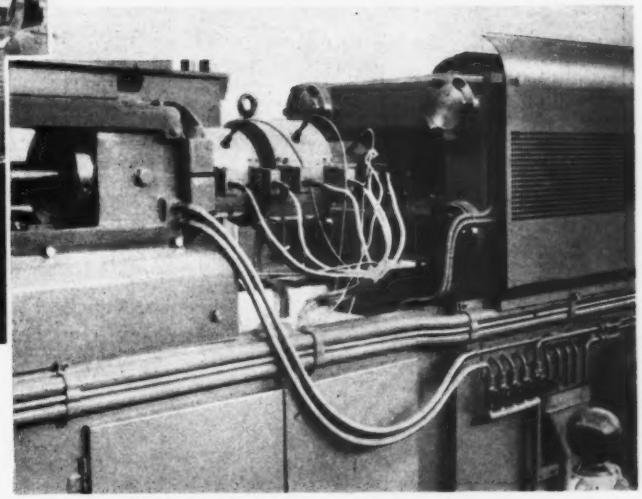
(Below) Eckert and Ziegler injection press, operated from separate accumulator.

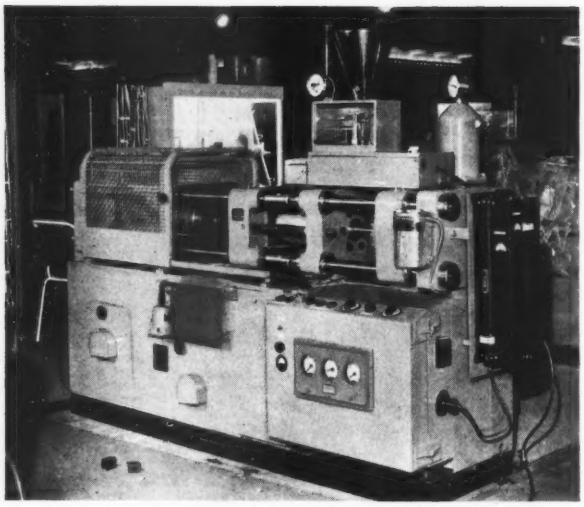




(Above) Hahn and Kolb vacuum forming machine.

(Right) Barrel and die-plate on the Ankewerk injection moulding machine.





Automatic 2 oz. injection moulder, fitted with dosing scale, shown by Battenfeld.

EH80, plasticizing approximately 8 lb. of material per hour, was typical of this type. The diameter of the injection plunger is 1.3 in. and the machine is controlled by two hand levers. Built on the open principle and mounted on an angle-iron frame, the EH80 is economical in use, and is designed to operate with water as a hydraulic fluid.

At the other end of the scale was the EH500, a 16-oz. machine, also equipped to operate as a self-contained unit or by means of group accumulator hydraulic drive. The diameter of the injection plunger here is 2.9 in. and the total force on the injection plunger is 51 tons.

The main difference between the Eckert and Ziegler series and the Stübbe machines lies in the locking mechanisms which instead of being of the toggle type depends on pressure rams. It is doubtful whether the argument as to the relative efficiency of these two methods will ever be solved, but it is certainly true that with machines up to 16 oz. capacity the in-line locking system obtained with the toggle mechanism can frequently be dispensed with.

Again, Eckert and Ziegler concentrated mainly on the smaller-capacity machines between 1½ oz. and 10 oz.

A very extensive display of injection moulding machines was made by **Battenfeld.** This company is probably largely responsible for the present trend in machine design in Germany which is towards standardized equipment with capacity of up to 50 oz. As a result of this standardization technique, the company has gained wide experience from moulders in West Germany with the result that the equipment now incorporates a number of interesting features. For example, a pneumatic cushion is incorporated which operates without the aid of control valves, pumps or compressors. This tends towards the modified unit which at the same time provides the follow-up pressure which is called for with modern moulding techniques. Another feature is that separate electric motors are used for closing the machine and for injecting the material.

A special ejection device can be installed, returning the pins to the injection position immediately after ejection, so that the placing of inserts is greatly facilitated.

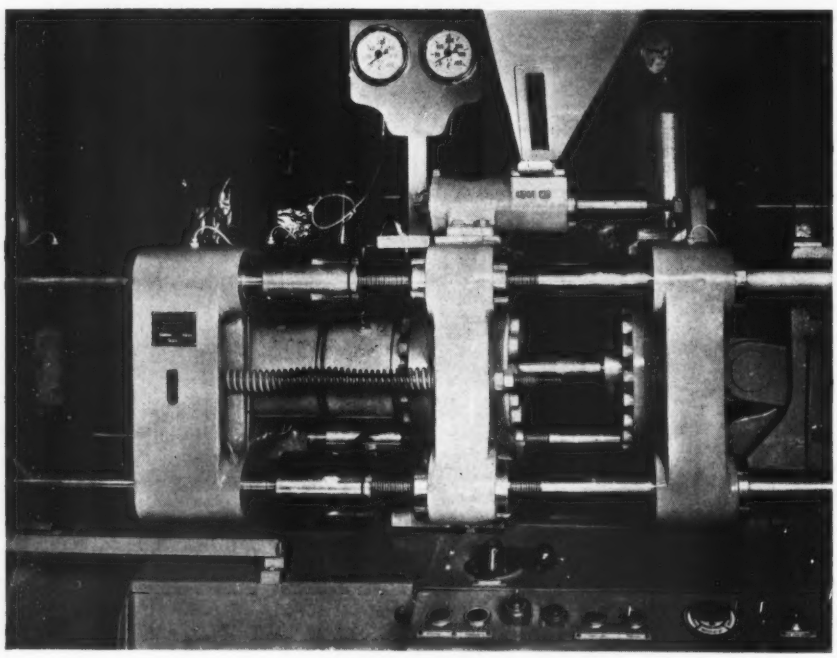
Automatic operation is a special feature of these machines and three timers are used to control injection, lock and cure periods. This greatly facilitates the high-speed cycling that is considered essential in modern machine construction.

Another machine which dispenses with the toggle mechanism is the Bussman model GH 10 marketed by **Hahn and Kolb.** Designed to operate automatically, the power unit is self-contained. The power required for closing the mould and for injection is derived from a high-pressure pump so provided as to enable injection also to be delayed according to the kind of materials used. Mould closing and injection are performed by a hydraulic piston in one stroke and a conveyor worm incorporated in the hopper provides accurate feeding and is especially suitable for finely divided powders.

The automatic mechanism is provided with safety controls so that the machine will stop in the event of mouldings not being properly discharged and also in the event of any clogging in the injection nozzle.

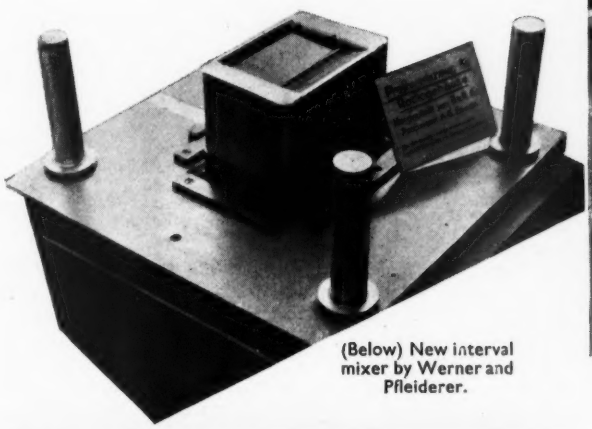
A special feature of the machine is a high-pressure rotary pump which included three pressure speeds, enabling the capacity of the driving motor to be used to the best possible advantage.

This machine has a maximum injection capacity of 1.5 cu. in., giving up to 15 shots per minute.

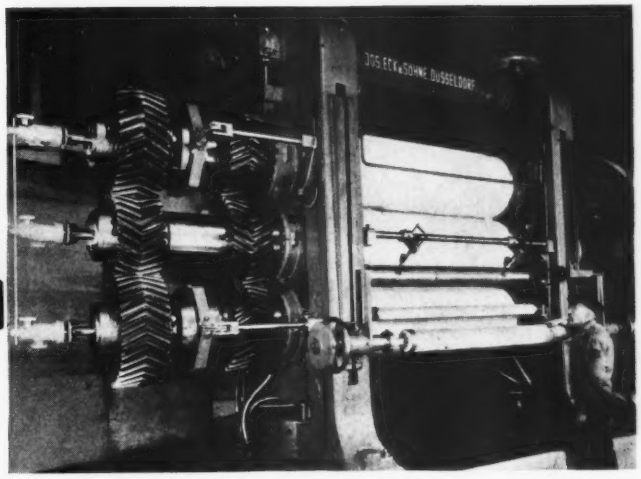


Close-up view of the Battenfeld B.S.M. 100 injection moulding machine.

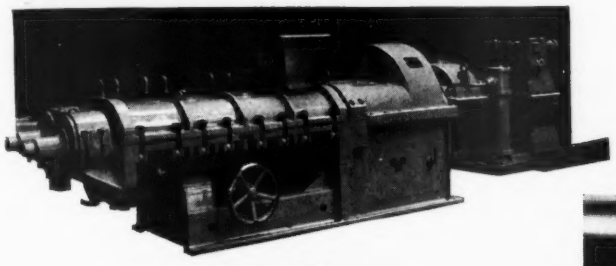
(Below) Tool for radio cabinet by Becker and van Hüllen.

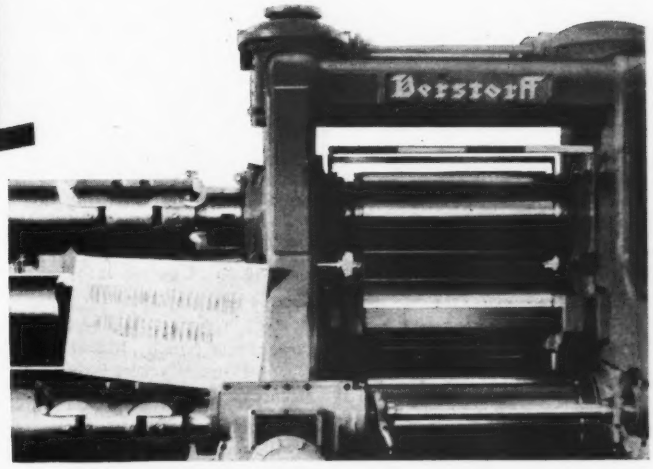


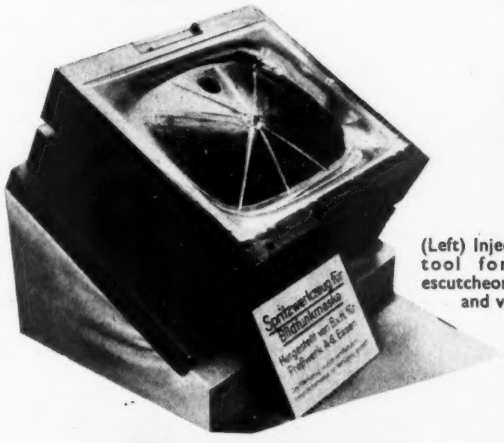
(Below) New interval mixer by Werner and Pfleiderer.



(Above) Calender by Jos. Eck.

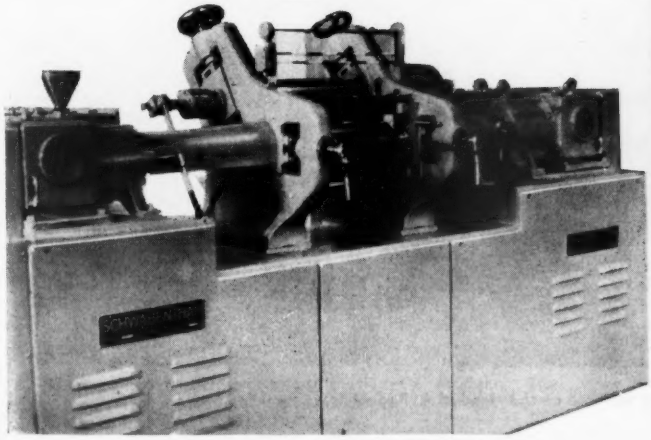


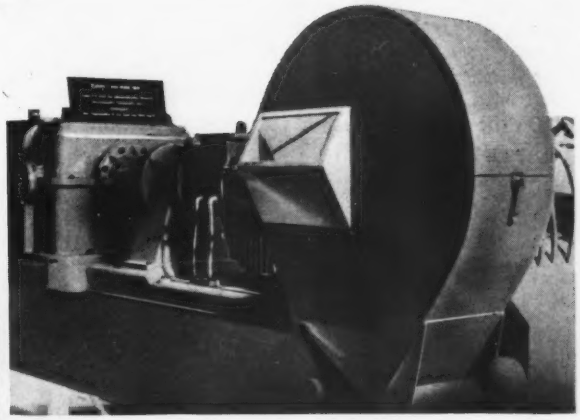




(Left) Injection moulding tool for television escutcheon, by Becker and van Hüllen.

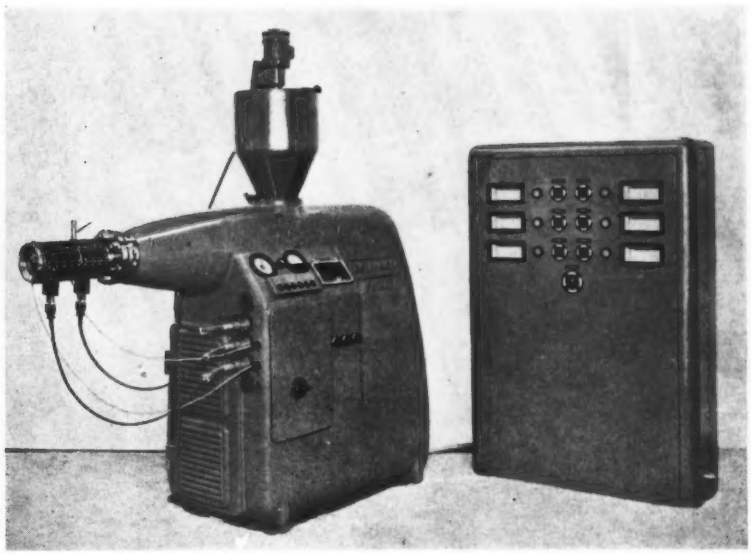
(Above) Berstorff calender/mixer.





(Left) Laboratory mixer by Schwabenthan.

(Above) Buss internal mixer.



The new Reifenhauser S60 RGV extruder.

Extruders

One of the most interesting exhibits was that shown by **Mapré S.A.,** the Luxemburg company, of a twin-screw machine. Type E2/54/92 is claimed to be suitable for the extrusion of almost all types of thermoplastic materials and is designed for the direct use of powders, delivering a finished product without preliminary treatment. The diameter of the screws is 3.6 in., rotation being reversible, the screws being articulated near the drive, and floating near the diehead. The extruder barrel has an effective length of 29 in., and the speed is continuously variable from 8 to 36 r.p.m. Cooling is by water, oil or air.

Three heating zones are incorporated in the barrel and control is maintained by means of a separate panel. Mapré of course are famous for the quality of manufacture and especially favourable reports have been circulated about this particular machine.

As an important adjunct to the extruder, there is available a granulating machine for thermoplastics, delivering granules having a cylindrical shape.

A German machine little known in Great Britain is that manufactured by **Ruth Schwabenthan,** marketed in Germany at about 18,000 DM. (£1,600) and apparently very suitable for the production of small-diameter profiles. This machine is also fitted with three heating zones along the barrel and is controlled by a separate panel adjacent to the machine.

On the stand of **Berstorff** was shown a versatile extruder, series No. K6054 with a screw diameter of 2.36 in. fitted with a 10 h.p. motor. The screw speed is infinitely variable from 15 to 80 r.p.m. and the temperature control range is up to 400° C. Output, depending upon type of plastic material and cross-sectional area of product, is up to 55 lb. per hour. For a machine of relatively small diameter, this output is considerable.

The general construction of the machine follows the pattern established by Berstorff in many other engineering fields. It is especially robust in design and again the control is effected by means of a separate panel.

Special equipment is offered for sale with this instrument for the production of lay-flat film, colouring and granulating and the coating of paper and textiles.

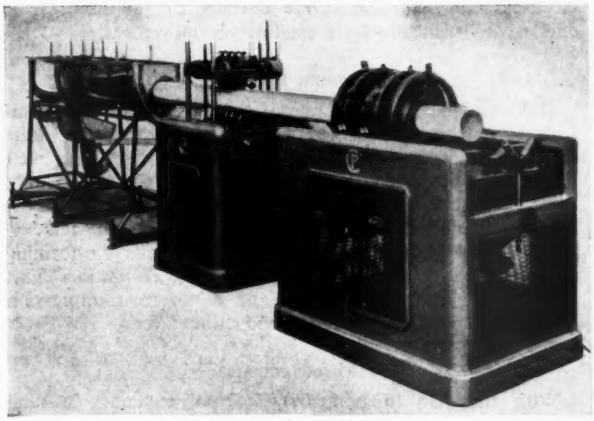
Another famous name well to the fore at Düsseldorf was **Carlo Pasquetti,** showing a bi-helicoidal compounder extruder with a material capacity of 220 to 330 lb. per hour. A 20 h.p. motor is used to drive this machine, the screw diameters being $3\frac{7}{8}$ in. Hydraulic speed variator gives from 10 to 20 r.p.m. This machine is probably the most effective in output of all to be shown at this exhibition. Pasquetti machines are built in Great Britain by T. H. and J. Daniels, Ltd., of Stroud, Gloucestershire.

One of the largest stands was that of **Reifenhauser** devoted to the company's extensive range of extruders and ancillary equipment. The size of the exhibit may be judged from the photograph below and a close-up of the S60 RGV machine is also shown on this page. Encased within a streamlined frame, the machine is a very robust design. The built-in motor is connected to the gear by V belts and the electro-magnetic clutch is fitted between the gear and the geared reduction. All rotating parts run in ball bearings and oil lubrication is effected, by means of a special gear pump.

The screw, which is nitrided and corrosion proof, is of 2.36 in. diameter, the ratio of screw diameter to length being

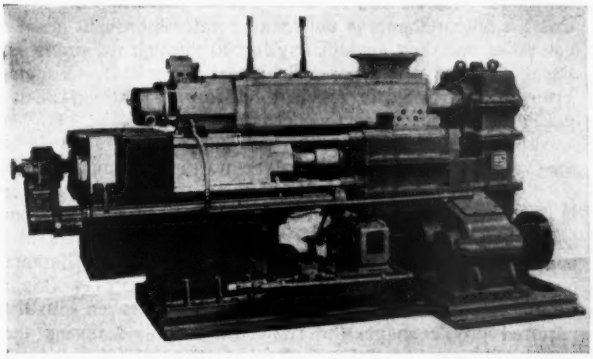
Extruders and ancillary equipment featured on the stand of A. Reifenhauser.

(Below) Take-off equipment shown on the stand of Pasquetti.

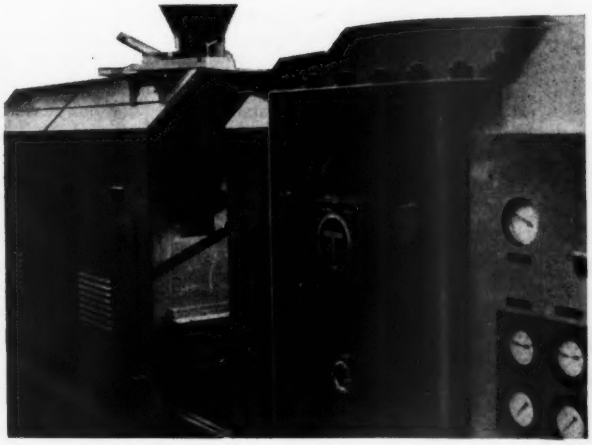


(Below) The Jos. Eck extruder.

(Right) The Schwabenthan extruder, showing heating zones and control panel.

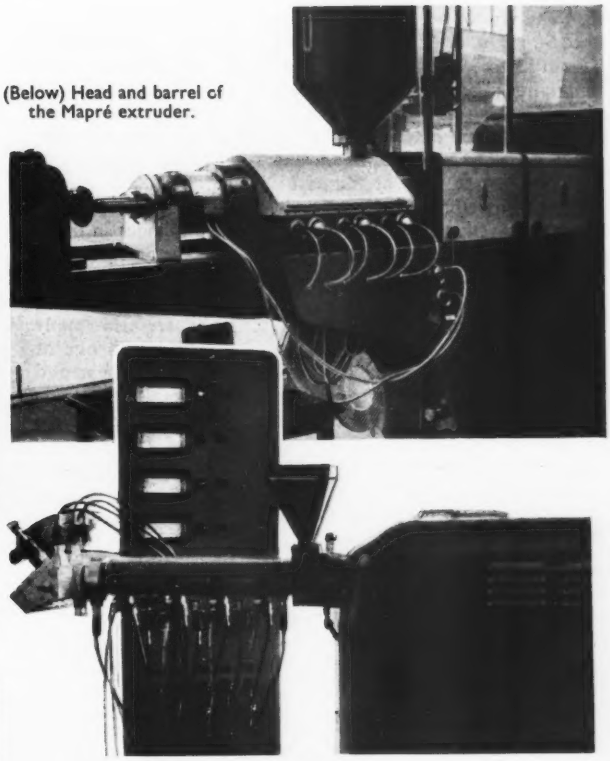


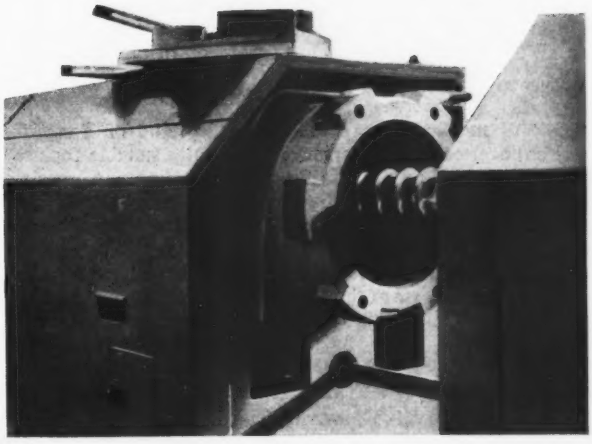
(Right) A view of the Troester extruder, showing the barrel withdrawn from the screw.

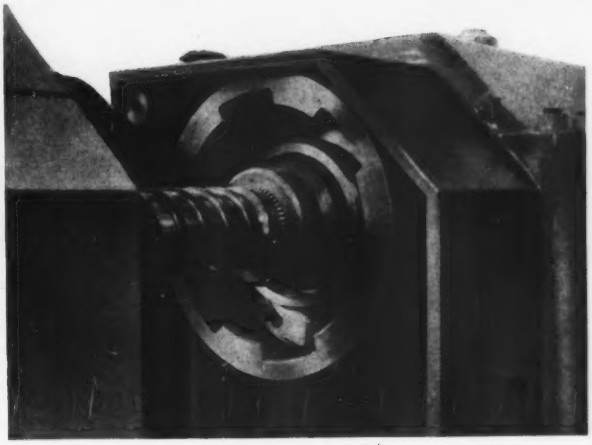


(Above and right) Other views of the Troester machine. The movable section of the barrel can be clearly seen.

(Below) Head and barrel of the Mapré extruder.







15. The screw speed is infinitely variable in two rates, from 15 to 90 r.p.m. or 12 to 72 r.p.m. The output of this machine is from 55 to 88 lb. of material per hour, depending upon the material used and the cross-sectional profile. The temperature of each heating zone is regulated separately by thermocouples and control pyrometers. The accurate control of temperature has been a special consideration of the designers of the machine and plus or minus 1° is guaranteed.

The thermocouples are so fitted that their contact reaches to within a few mm. within the wall of the cylinder in order to get as accurate a recording of the temperature as possible.

A wide series of extrusion heads are offered in conjunction with these machines, including film making, paper coating, wire covering, and lay flat tubing. Reifenhauser also supply a granulating device to be used in conjunction with one of the machines as a compounding unit, a multi-colour head and a calibrating head. The feature of this last-mentioned device is that the tubing is not pressed against the calibrating die by introducing compressed air but is sucked continuously towards the wall of the calibrating head by means of a vacuum.

Testing Equipment

Testing equipment was shown in a special hall. Although the DIN specifications differ in many respects to those of the A.S.T.M. and the British Standards Institution, there is, through the International Standards Organization, a much closer co-operation than was formerly the case. For this reason, testing equipment shown in Germany is becoming more and more comparable with that built in Great Britain and America. One of the more interesting exhibitors, was, however, **Karn Franck,** offering a complete range of equipment for the plastics and rubber industries. Included were abrasion testing machines, impact testing equipment and tensile testing machines. A high standard of finish was noticeable on all the equipment shown in this section of the exhibition.

Calenders

One of the interesting exhibits on the stand of **Berstorff** was an inverted L calender/mixer, eminently suitable for use in laboratories and for small-scale production. A special feature of this machine is the clear separation of the driving mechanism from the mixing rolls, providing for easy cleaning and eliminating almost entirely contamination of material by oil and dirt. It had been hoped that Berstorff would also show, as was the case at the Hanover Fair, a full-scale production calender. Only smaller plant and equipment was, however, on show.

Paul Troester, of Hanover, offered a fine display of plastics equipment including a scale calender. The main item of interest was, however, an extruder incorporating a sliding barrel. The construction of these machines, known under the series code as U.P., is based on the unit assembly system. A prime advantage of the sliding barrel lies in the speed with which the screw can be cleaned when changing from one colour to another. Bayonet couplings are provided for all electrical connections and the opening of the machine is effected hydraulically by a single lever movement.

Vacuum Forming

Hahn and Kolb showed one of the most efficient vacuum-forming machines at the exhibition, having a depth of draw of 16 in. Known as the Neubra, type 1700, the platen area measures 62 by 32 in. and provision is made for deep drawing as well as vacuum forming as may be desirable. This model is equipped with twin platens and a 12-kW. heating unit.

Vogt and Hartmann showed a twin-platen vacuum-forming machine Plastiplast type 54B, platen area 37 sq. in. This machine was demonstrated with the aid of multi-impression tools and achieved interesting production rates.

Miscellaneous

With the rise to popularity of polyurethane foaming materials, it was rather expected that a machine would sooner or later be devised to take charge of the continuous extrusion of profiles and rods. **Alkett** showed a specially modified machine suitable for the purpose and one which has given satisfactory results and service. The principle appears to be that the polyurethane, in the foamed state, is brought near to gell point and then immediately forced through the profile of the die, during which phase final heat is applied. Samples brought back indicate excellent uniformity and no distinguishable differences to the normally foamed slabs.

Although reinforced plastics were not extensively shown at the Dusseldorf exhibition, one of the most interesting machines on display was that shown by **Zimmer,** designed to produce in one continuous process tubes and profiled screens from glass filaments bonded with such resins as polyesters and epoxys. The photograph shown on this page of the Zimmer machine will give some indication of the system of working; bobbins of glass monofilament are virtually woven into the required profile shape, the resin being applied during the weaving process. A feature of this method of fabrication is that the hand lay up process is completely eliminated and production rates of a considerably higher order are made possible.

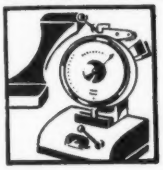
A new internal mixing machine was shown by **Werner and Pleiderer.** Based on the twin-screw principle, the unit is expected to be available before the end of the year. The version on the stand was complete, except for the finishing of the screws. It is steam-heated, and is known as the K.K. 300. No details are available yet on its performance, but the staff of the company were optimistic about its success.

The Swiss company **Buss** showed the Ko-Kneader mixer already in use in Britain. A full description was published in the November, 1954, issue of *Plastics*, and notes on its use appeared in the August issue for this year.

Zimmer machine, for the manufacture of reinforced plastics rods and tubes.

World's Industry Employs Plastics

MATERIALS and TESTING



Cellular polythene has been developed for certain applications. The properties of the base resin are changed to obtain lighter weight, lower dielectric constant, lower thermal conductivity and greater bouyancy with little or no sacrifices of the other properties inherent to polythene.
(*Materials and Methods*, 1955/Aug./163.)

Anti-microbe plastic film.—A vinyl plastic film is treated with a new anti-microbial compound of high permanency. The treatment does not impair original colour and texture of the vinyl film, which remains non-toxic, odourless and colourless.
(*Materials and Methods*, 1955/Aug./158.)

Isocyanate base polymers.—A brief review of developments of these polymers which include the polyurethanes, the polyureas and the polyamides, is given dealing with elastomers, adhesives, potting compounds, expanded plastics, heat resistant plastics and greases.
(*Materials and Methods*, 1955/Aug./84.)

Nylon with phenolic resin bonding.—A highly resilient padding material is composed of nylon fibres bonded with phenolic resins. Though more expensive the high durability makes the material more economical in use.
(*Materials and Methods*, 1955/Aug./144.)

Vinyl plastisol dispersion coatings.—T. B. Meniel gives a survey of these corrosion resistant and decorative-protective films. Since their first introduction in 1944 steady improvements have been made. Many coating techniques such as spraying, dipping, electrostatic spraying can be used.
(*Materials and Methods*, 1955/Aug./100.)

Nylon in liquid form.—A new nylon type 8 can be applied from alcohol solutions, moulded, milled and calendered. A wide range of colours is offered, as material accepts certain classes of dies readily. Moulding powders are also available.
(*Materials and Methods*, 1955/Aug./138.)

Testing of plastic foils.—A German draft standard DIN 53 381 has been published for a testing method to determine the liberation of hydrochloric acid when heating plastic foils.
(*Kunststoffe*, 1955/Aug./347.)

Tear resistant silicon rubber.—Fibrous Teflon reinforcements multiply the tear strength and also increase oil-resistance without sacrificing other properties.
(*Materials and Methods*, 1955/July/106.)

Cold-setting reinforced resins.—J. Norvis and H. L. Riley describe the use of cold-setting resins for plant constructions and maintenance.
(*Gas World*, 1955/3681/555.)

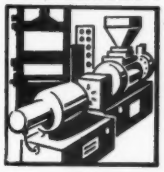
Vinyl plastisol sponge.—A new series of plastisols when subjected to heat of 300 to 400° F. for 3 to 30 min. produce a uniform vinyl sponge. The plastisols contain chemical blowing agents and are available as liquids.
(*Materials and Methods*, 1955/July/162.)

Resin core.—A high-strength, lightweight material is produced from liquid phenol resin. It foams to a hard consistency at ambient room temperature. Density is controlled by amount of foaming agent.
(*Machinery* (*N.Y.*), 1955/Aug./174.)

Development of strippable coatings.—L. S. Metcalfe surveys the successful development of strippable coatings during the past few years and gives hints on coating operations, re-use, etc.
(*Canadian Machinery*, 1955/Aug./196.)

Cellulose acetate moulding materials.—Tables are presented of nine main types quoting the following properties: physical, mechanical, electrical and fabricating.
(*Materials and Methods*, 1955/July/129, August/129.)

PROCESSES : MACHINERY



Welding of flexible p.v.c. sheet.—K. Oberbach discusses the welding of sheets below 2 mm. thickness. Disadvantages of several methods are demonstrated and reference is made to the modern high-frequency methods.
(*Kunststoffe*, 1955/July/266.)

Welding and hot moulding of Saran fabric.—Tests were made with hot wedge and high-frequency welding to find a relationship between welding strength and welding pressure, speed and temperature. Deep drawing processes were also investigated.
(*Kunststoffe*, 1955/July/272.)

Flame spraying of plastics.—R. Kuehfuss states that the development of this method has progressed so that a number of plastics can be treated successfully, but an accurate knowledge of the particularities of the process is necessary.
(*Industrieblatt*, 1955/July/325.)

Moulds and apparatus for vacuum forming.—Hints for the design of moulds and ancillary apparatus for positive and negative moulding are given.
(*Kunststoffe*, 1955/July/313.)

INDUSTRIAL APPLICATIONS

Potting and encapsulation. — Up-to-date methods for using epoxy resins are described by M. D. Pugh in a well-illustrated article. The various processes are described and ultimately it is referred to the automatic potting machine developed by the National Bureau of Standards.
(*Instrument Manufacturing*, 1955/July/Aug./120.)

Plastics in mining.—G. G. Heathcote gives a survey of the application of plastics in mining as at present and in the future.
(*Iron and Coal Trades Rev.*, 1955/4537/677.)

Industrial uses of nylon.—G. K. Lake cites six important applications: Grinding wheels, laundry nets, tyres, ships' ropes, typewriter ribbons, conveyor belts.
(*Mod. Textile Magazine*, 1955/March/58.)

Plastic aids welding of titanium.—Solar Aircraft Co. using a vinyl bag to maintain a controlled atmosphere during welding of titanium components. The bag is zippered, gas tight and sealed to a standard welding table.
(*Materials and Methods*, 1955/July/103.)

Transparent plastics in horticulture.—Owing to the extended use of greenhouses in Germany, experiments were made with regard to the use of p.v.c., cellulose acetate and cellophane for replacing glass. It was found that these plastics withstand exposure to constantly changing weather conditions fairly well, so that their use can be recommended.
(*Kunststoffe*, 1955/July/315.)

MISCELLANEOUS USES

Sliding plastic top on all-plastic car.—A special convertible car by W. Fajole is built around a retractable Plexiglas canopy, giving the effect of either an open or closed car. The motor-operated roof similar to a sliding garage door slides easily on nylon bearings.
(*Automotive Industries*, 1955/Aug./15/94.)

Finish for reinforced plastics.—J. S. Bowen describes a new moulded-in finish using a low-cost laminating technique to apply a non-woven cotton fabric which hides cloth and mat reinforcements and gives an enamel-like finish.
(*Materials and Methods*, 1955/July/104.)

Drawing instruments in plastics.—Description of various types of engraved and graduated drawing equipment made in U.S.A.
(*Technica* (*Berne*), 1955/Aug. 19/819. Producer: Graphic Calculator Comp., Chicago 5, Illinois, U.S.A.)

Plastics for motorcar bodies.—J. U. Augustin gives a survey of the present state in the use of plastics in the U.S.A. Properties of plastics; manufacturing processes.
(*Konstruktion*, 1955/July/270.)

Nylon in ships' instruments.—Discussion on the use of plastics in ships' instruments following a lecture by F. C. Eccles.
(*Instrument Practice*, 1955/Aug./798.)

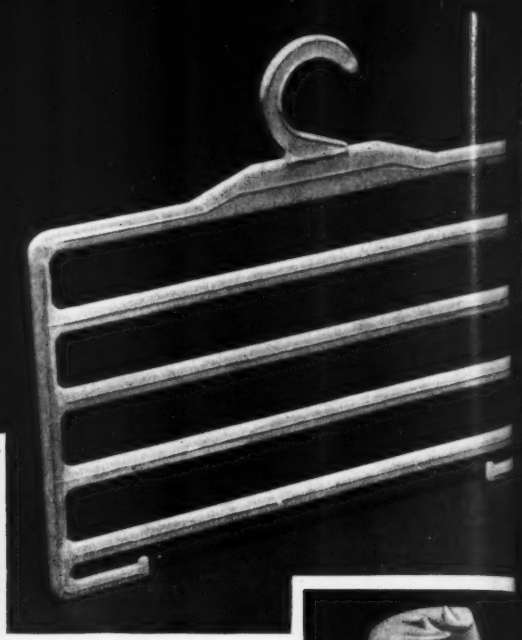
Urea Processes Compared.—A comparison of three processes for the manufacture of urea in the United States is given by W. H. Tonn.
(*Chemical Engineering*, 1955/Oct./186.)

PLASTICS
IN THE SERVICE OF MAN

A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

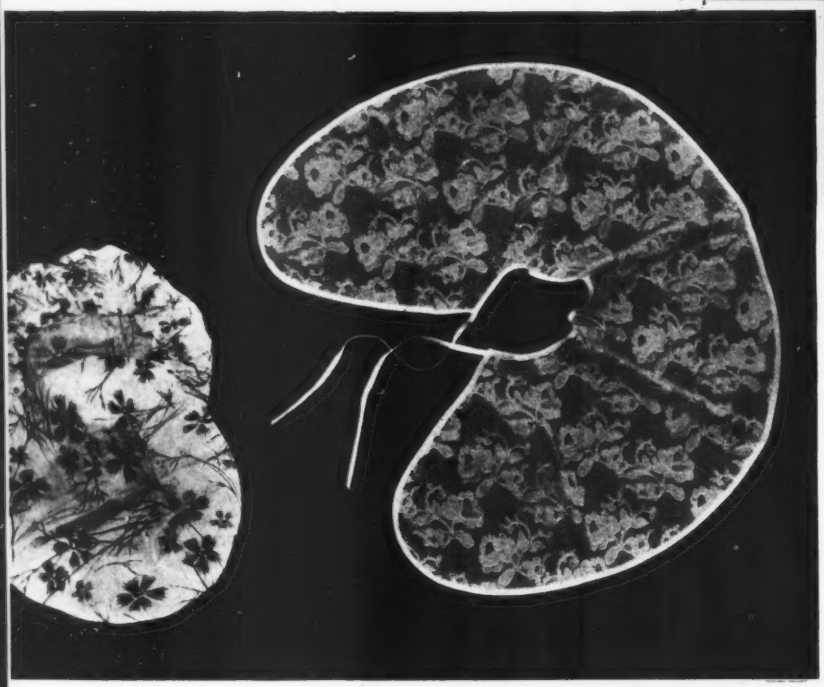
61. Plastics in the Bathroom - II

A list of trade-marks and companies mentioned in this review, with full names and addresses, appears on page 394



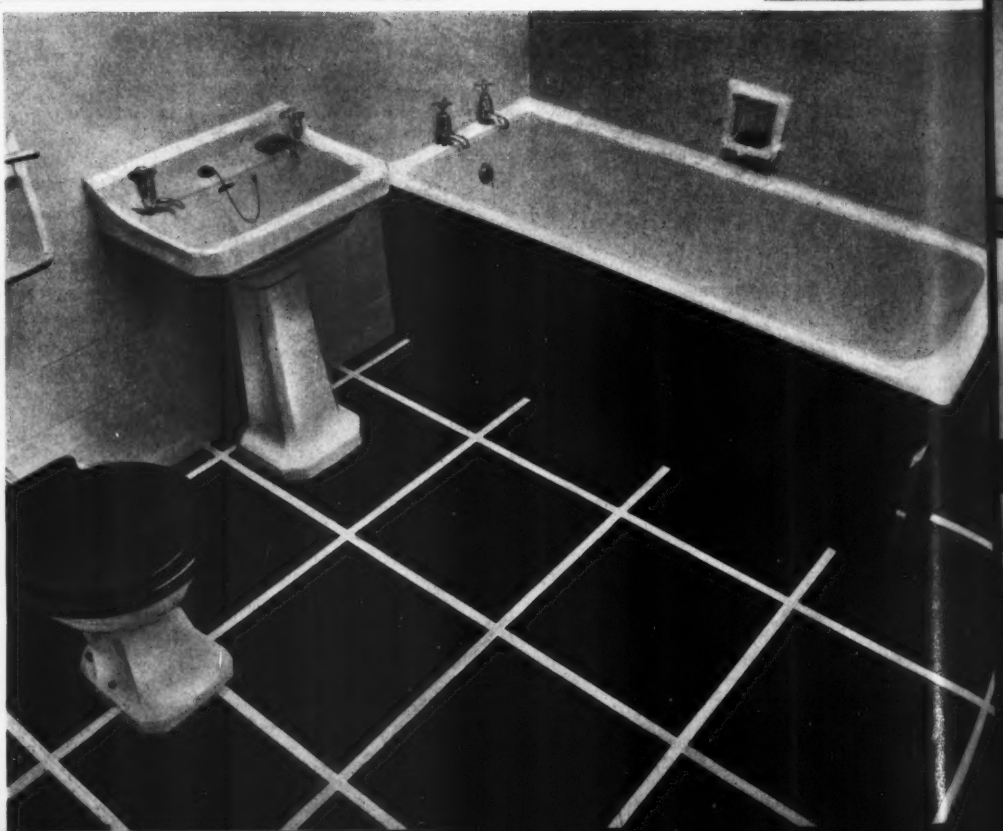
(Above) Stocking dryer moulded by O. and M. Kleemann Ltd., in Kleestron polystyrene.

(Right) Kleen-e-ze toilet brush holder injection moulded in polythene by Universal Metal Products Ltd.



(Above) Shampoo cape and shower hat made from Velbex p.v.c.

(Above) Toilet roll holder moulded in phenolic material. It is also available in urea materials and is produced by Evered and Co. Ltd.

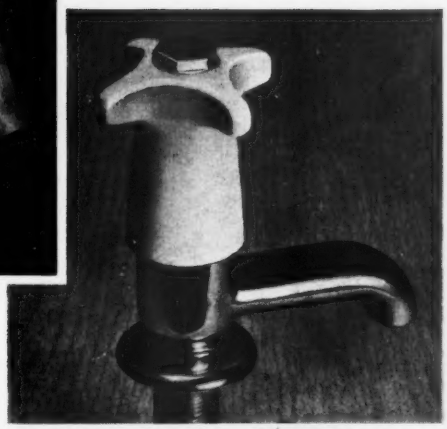


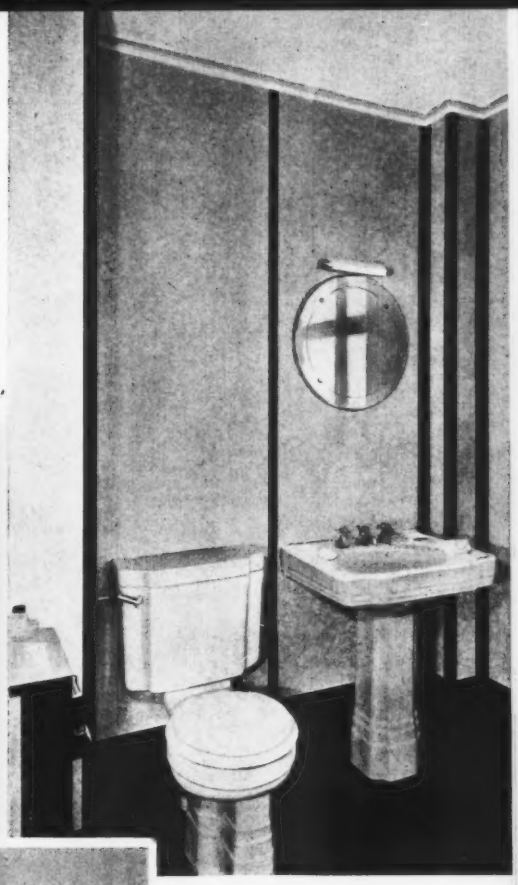
(Right) A bathroom floor in which black thermoplastic tiles are separated by white feature strips of the same material. Manufactured by Marley Tiles Ltd.

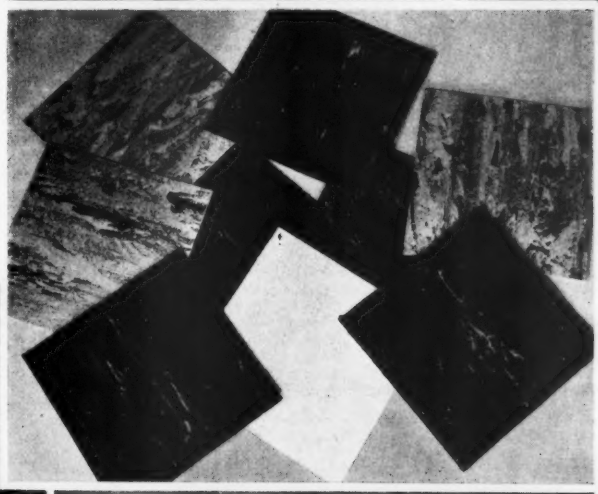
(Above) Shower and bathroom curtain material in printed p.v.c. made by B.X. Plastics Ltd.

(Right) Bathroom panelled in Formica.

(Below) Pillar cock with a moulded melamine head produced by Evered and Co., Ltd.



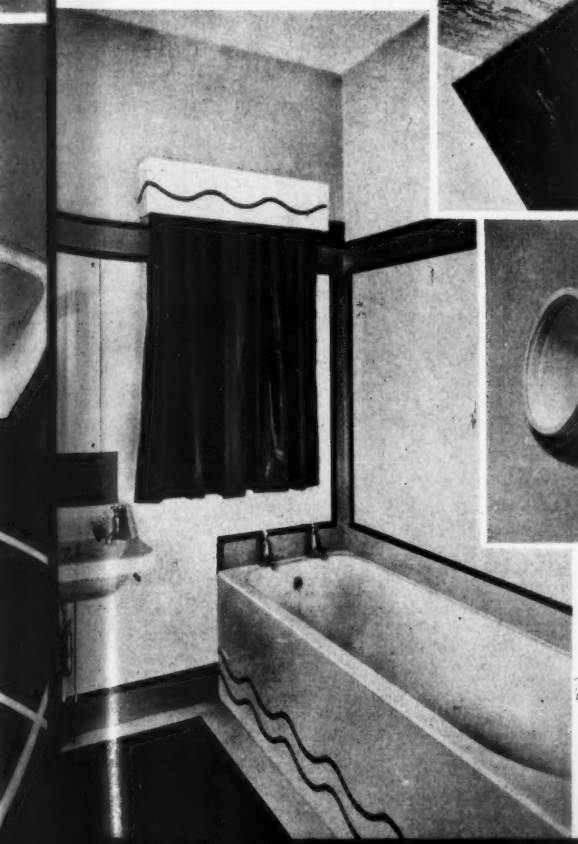




(Left) P.v.c. floor tiles manufactured by Phoenix Rubber Co., Ltd.

(Below) Racasan toilet seat and lid moulded in phenolic material by Universal Metal Products Ltd.

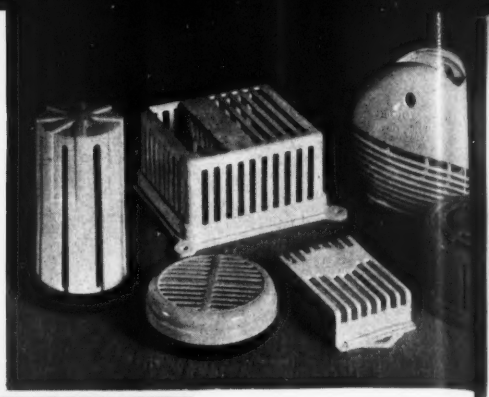
(Below) Bathroom with bath and wall panelling in Warerite.

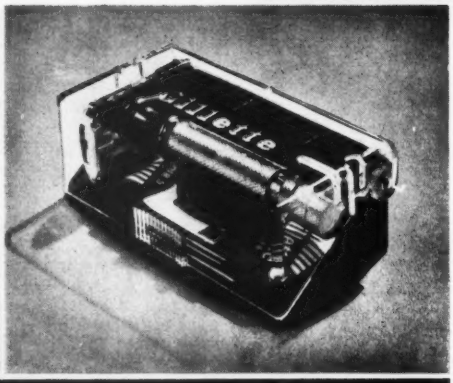


(Above) Soap dispenser, denture bath and tooth mug moulded in paper-filled urea by Crystalate Ltd.

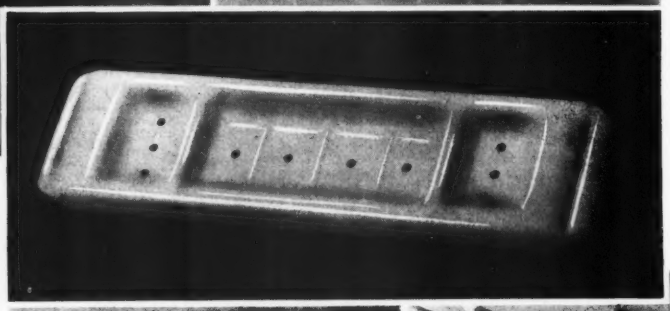
(Above) An illustration of the use of Formica panelling in the bathroom.

(Below) Razor set packed in an injection moulded Bextrene case.





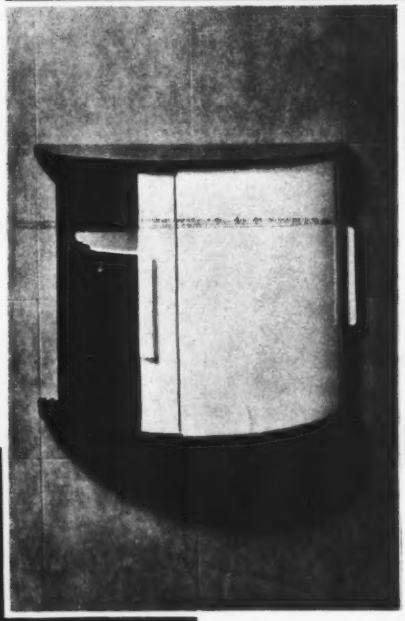
(Above) A selection of air purifiers moulded in cellulose acetate, polystyrene, and polythene by Universal Metal Products Ltd.



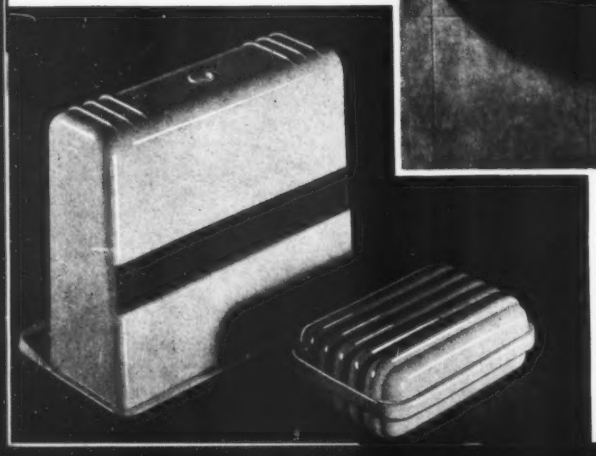
(Left) Bath tray moulded in Perspex by Thermo-Plastics Ltd.

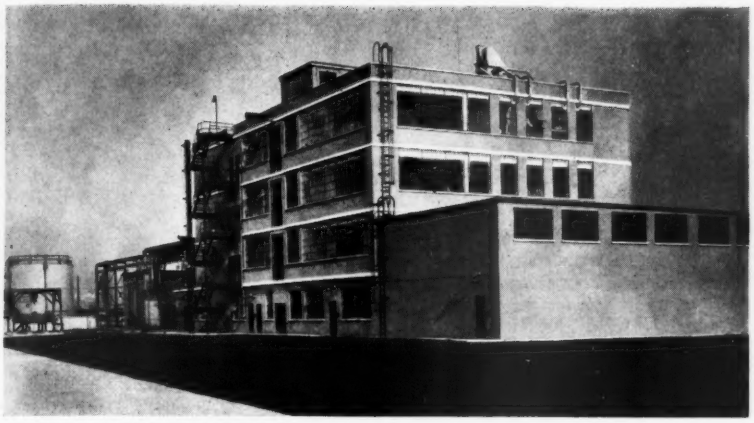
(Below) Warerite has been used for the panelling in this bathroom.

(Right) Bathroom cabinet fabricated from Perspex by Thermo-Plastics Ltd.



(Below) Toilet paper holder and soap box moulded in Kleestron polystyrene by O. and M. Kleemann Ltd.





New Styrene Plant Opens In Britain

The Distrene, Ltd. factory at Barry.

A press conference on October 17 in London was held to launch the new company, Distrene, Ltd., and to announce the start of production of polystyrene, under the trade name of Styron, in South Wales. These notes on the new plant have been specially prepared for "Plastics."

DISTRENE, Ltd., is the result of a new Anglo-American partnership in the plastics field. It is jointly owned by The Distillers Co., Ltd., and the Dow Chemical Co. of Midland, Michigan, U.S.A.

Construction work on the complex plant to produce Styron and the buildings to house it was started in November last and was completed in the record time of 10 months. The rated capacity of the plant is 6,000-7,000 tons per annum.

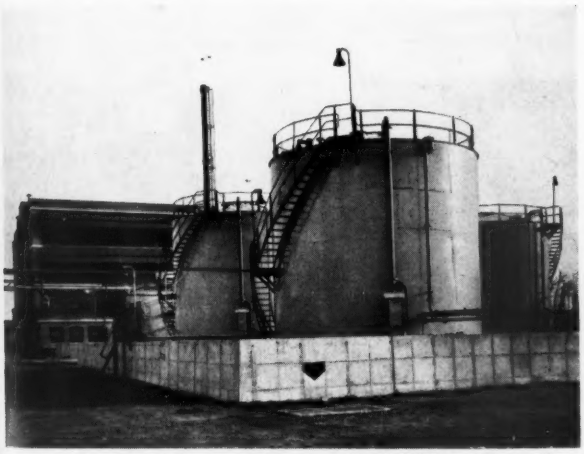
The Styron plant is situated at Barry in South Wales on the 92-acre site also occupied by two other companies in The Distillers Co., Ltd., making plastics materials, namely British Resin Products, Ltd., and British Geon, Ltd.

To begin with, the new company will make Styron 666 and Styron 475. Until now these materials, which have a world-wide reputation in the plastics industry, have been made only in the U.S.A. and Canada.

Plant Design and Operation

The overall design of the plant follows fairly closely the more recent of the American units. But important modifications in lay-out and equipment, suggested by actual operating experience, have been made; so that the Barry plant may well be reckoned as the most modern of its kind, both in time and conception.

The basic raw material for the process, styrene monomer, is produced at Grangemouth, Scotland, by Forth Chemicals, Ltd., and delivered to the site in road tankers or rail wagons.



Another view of the Styron factory in South Wales. The tank farm in the foreground emphasizes the production potential of this unit.

The subsequent polymerization of the monomer and the colouring process are highly complex.

Since close control at all stages is essential, an important feature of the plant is the high degree of automatic control which has been achieved. Modern developments in instrumentation technique have been incorporated in the design.

All key processes are regulated automatically and the controlling instruments, which are also continuously recording, are housed in a central control room, so that the state of the plant at any time can be immediately observed.

As a result, manual operation is simplified and considerably reduced in amount, so that the involved manufacturing process can be carried out by a small body of operators.

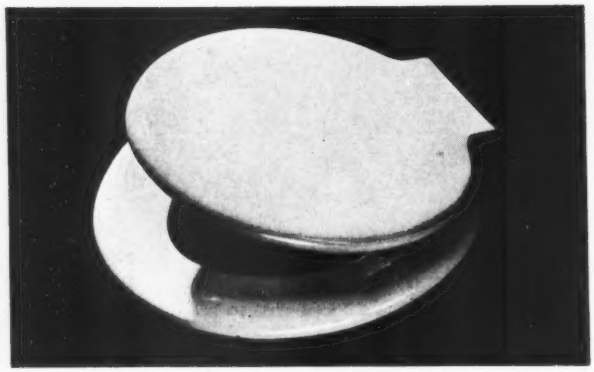
The plant is air conditioned; filtered air, warmed in winter, circulates under a slight positive pressure to ensure a dust-free atmosphere. The flow of material through the plant has been so designed that there is no exposure of material at any stage from storage tank to finished product hopper. As a further precaution against dust contamination, lawns have been laid in the area immediately surrounding the plant buildings.

The maintenance of a consistently high quality product is greatly helped by routine sampling and testing which is carried out night and day. All stages of the process are under observation.

This work is the responsibility of the control laboratory which is housed in the central building to allow easy communication with the production staff. The laboratory possesses modern testing apparatus and a number of automatic injection moulding machines for the preparation of test specimens. A wide range of properties, including physical, electrical and colour characteristics, are tested.

A separate section is concerned with the examination of the general moulding behaviour of the products. These are investigated under conditions closely resembling those operating in moulding shops. In this way a practical assessment can be made.

The control of colour during processing and of the end materials is particularly important as it is necessary to work to close tolerances. Techniques based on spectrophotometer analysis are employed. These methods are rapid and have the advantage that colour compositions can be evaluated in quantitative terms so that the subjective assessment by the human eye, with its attendant difficulties, can be avoided. They have a further important use in the colour-matching service which the laboratory provides. Non-standard colours.



Styron 666 has been used to mould this lightweight lavatory seat and cover.

i.e., those not on the basic Styron range, can be quickly and accurately matched to meet customers' requirements.

Necessarily in such a brief review, few only of the interesting features can be mentioned. Styron moulding powders have been made in America by a process which has proved itself over the years. The present British plant has adopted this process and elaborate instrumentation both in the production side and laboratory guarantee the high standard of the British product.

Two typical applications of Styron moulding powders are illustrated on this page, and the following details of properties will be of interest.

Styron 666

Styron 666 is a general-purpose polystyrene possessing excellent physical properties and moulding characteristics designed to meet the requirements of a wide range of applications. It is used extensively in the manufacture of both industrial and domestic mouldings. The many applications of Styron 666 include refrigerator parts, wall tiles, packaging, covers, housings, electrical and radio equipment and a wide variety of articles used in the home. It is primarily processed by injection moulding, but it may also be formed by extrusion and compression-moulding techniques.

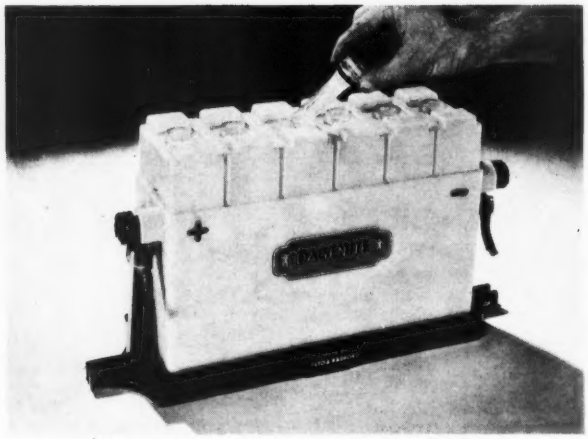
The general and mechanical properties of Styron 666 are given in Table 1.

TABLE 1. PROPERTIES OF STYRON 666

	Range or Value	Method of Test
Bulk factor	1.8–1.9	Untapped, similar to B.S.771
Specific gravity	1.04–1.06	By displacement
Tensile strength lb./in.^{2}	5,000–6,500	B.S.1524
Elongation at break %	1.5–2.5	Internal method
Charpy impact strength ergs/cm.^{2}	1.5×10^6–3.0×10^6	Internal method
Izod impact strength ft. lb./in. notch	0.25–0.5	B.S.1493 Appendix "E" $\frac{1}{4}"\times\frac{1}{4}"$ notched test piece
Young's modulus lb./in.^{2}	1.5×10^5–5.0×10^5	Extension/load
Brinell hardness	20–23	10 mm. Ball, 250 kg. load
Water absorption mg.	2–5	60 days' immersion at 20°C. 2" dia.×1/16" thick disc
Softening point	88°C.–92°C.	B.S.1493
Specific heat cal./°C./g.	0.32	—
Methanol soluble matter %	3.5–4.0	B.S.1493
Effect of U.V. light	negligible	—
Volatile matter %	< 1.5	B.S.1493

Styron 475

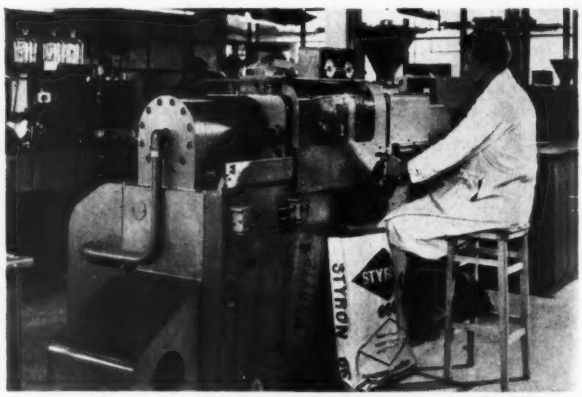
Styron 475, a toughened polystyrene, is a rigid thermoplastic material belonging to the styrene/rubber class. While many of its properties are similar to ordinary polystyrene, its impact strength and elongation at break figures show Styron 475 to be a much tougher material. The elongation figure (10-30%) indicates a degree of flexibility not possessed by ordinary polystyrene (1.5-2.5%) and its impact strength is some 3-5 times greater. This improvement has been effected without undue detriment to other desirable properties. The general and mechanical properties of Styron 475 are given in Table 2.



R.A.F. type Aircraft Battery 12 volt 40 ampere-hour by Pritchett & Gold Ltd., Dagenham. Six-cell Monoblock moulded in Styron 475 by E. K. Cole Ltd.

TABLE 2. PROPERTIES OF STYRON 475

	Range or Value	Method of Test
Bulk factor	1.8–1.9	Untapped, similar to B.S.771
Specific gravity	1.04–1.06	By displacement
Tensile strength lb./in.^{2}	3,000–4,000	B.S.1524
Elongation at break %	10–30	Internal method
Charpy impact strength ergs/cm.^{2}	8×10^6–12×10^6	Internal method
Izod impact strength	1.0–1.8	B.S.1493 Appendix "E" $\frac{1}{4}"\times\frac{1}{4}"$ notched test piece (compression)
Young's modulus lb./in.^{2}	3.4×10^5–4.0×10^5	Extension/load
Brinell hardness	13–16	10 mm. Ball, 250 kg. load
Water absorption mg.	35	60 days' immersion at 20°C. 2" dia.×1/16" thick disc
Softening point	85°C. (185°F.)	B.S.1493
Specific heat cal./°C./g.	0.32	—
Effect of U.V. light	Impact strength and elongation are somewhat impaired by direct exposure to U.V. light	
Volatile matter %	< 1.5	B.S.1493



Test specimens are produced on this injection moulding machine, one of a battery of three installed in the Styron laboratory.

Electrostatic Flock-finishing

By V. BIRD

FOR the purpose of imparting decorative flock designs on webs of fabrics placed on screen-printing tables, the company Arno H. Wirth, of Reutlingen, Western Germany, in co-operation with C. Reisinger, have developed several efficient flock-printing units which, apart from their value to the textile industry, are equally suited for the "flocking" of plastics.

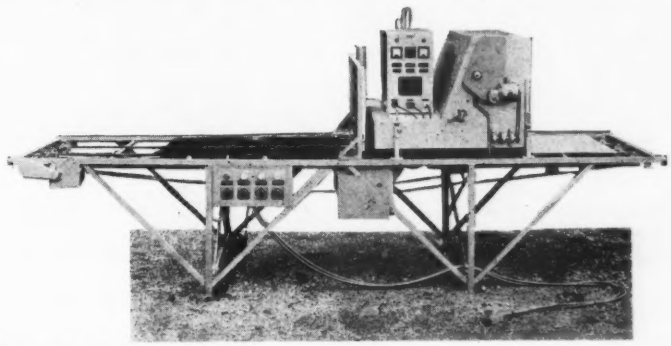
In the construction of these flock printers, special attention was paid to the removal of the superfluous fluff. The sequence of operations in the flock-finishing of layers of fabrics by means of electrostatic fields does not differ much from the method applied in screen-printing. The only difference lies in the fact that, with the electrostatic process, instead of colour, an adhesive —preferably a dispersion gum—is ornamentally spread on the fabric surface with the help of screen-printing stencils, in the pattern repeat system 1, 2, 3. Subsequently, the flock-finishing is effected by the wheeled flock-finishing carriage (or by means of a conveyor-belt system) which, in one single operation, propels the fibres vertically into the adhesive layer via the first oscillating electrode, while two other collector electrodes pick up the superfluous fluff statically and convey it back into the flock container by a special mechanical device.

This arrangement prevents the clogging together of fibres and allows proper and reliable static flocking. The operation of the plant is very simple and flocking can go on at any degree of air moisture. High operational speeds are reached. The flock container needs refilling only at shorter intervals. Additional advantages are offered by the separate use of the flocking and the collector electrodes, the quantitative control of the flock feed, the possibility of using the plant as a stationary installation as well as a portable unit for the flock-finishing of individual pieces (leather, plastics, skins, foam rubber, etc.), the height adjustment of the flocking electrode and the adaptability to narrower working widths. If so desired, a hygrometer, measuring the relative air moisture, can also be supplied.

After completion of the flocking process, polymerization of the adhesive and final cleaning takes place.

The necessary high tension is produced by industrial electrostats, which are made in three different types for coping with the respective working widths. The electrostats are mounted on the flock-printing carriage. For dealing with a working width of two metres, the type J 1000 has been built which, according to choice, delivers unloaded a tension from 40 up to 100 kilovolts. Two measuring instruments allow constant control of the working tension and the working current. Any fluctuations in the mains-current supply are automatically balanced.

The electric field is produced by the conversion of alternating current into high-tension direct current via a five-step cascade connection. For guaranteeing a maximum of operational safety, all high-tension conducting parts are made of first-class ceramic material ("Frequenta") and immersed in oil. That arrangement eliminates any harmful influence of air moisture. In case of a short-circuit or contact with high-tension conducting parts, or overloads above two milliamperes, the electrostat is automatically switched off by a protective relay, so that there is no danger of any bodily injury.



A.W.R. flock-printing unit, used with plastics.

The first requirement with the flock-printing procedure described here is that electrostatically prepared, in other words electricity-conductive, flock (made so by the charging with hygroscopic salts, such as those, for example, out of the ammonia group) is used for that purpose. In that way the dipole appearances, produced by the influence effect, are avoided. All flock fibres take on the same potential, repel each other and are propelled closely together in absolutely vertical direction into the adhesive layer of the grounded fabric (opposite pole). By that method, the desired velvet— or plush-like—finish is obtained, characterized by the vertical position of each single one of the fibres which are cut to absolutely precise lengths by special machines.

The illustration shows the A.W.R. flock-printing table unit, on which pieces of any base material can be flocked in any width according to requirements, by means of electrostatic high-tension fields. Flocking is done on a conveyor belt.

LETTERS TO THE EDITOR

It is understood that any letter received may be published at the discretion of the Editor.

Extruded T Bars and Angles

SIR,—We wonder if you can help us to find a manufacturer of extruded plastic T bars and angles, in white, approximately ½ in. × ½ in. × ¼ in., in lengths of about 6 ft. or longer.

This material is required for use in shop windows, etc., to support plastic egg crate louvres which we fabricate.

LUMITRON, LTD.

180 Shaftesbury Avenue,
London, W.C.2.

Replies Received

SIR,—We wish to refer to our letter published in the June issue of *Plastics*, 1955, regarding an inquiry we have received from one of our overseas associates for suitable material to protect idlers on pulley systems.

Although this problem is not yet settled we would like to express our appreciation of the considerable assistance you have given us in acquainting various manufacturers of our requirements. We have been contacted by a number of firms.

NATHAN AND ALLEN, LTD.,

131 Victoria Street,
London, S.W.1.

Chess Men

SIR,—We are anxious to contact actual manufacturers of plastic chess sets.

ABEL, LEMON AND CO. PTY., LTD.

109 Fenchurch Street,
London, E.C.3.

[EDITOR'S NOTE: Amongst the manufacturers of chess sets are: Catalin, Ltd., 54 Farm Hill Road, Waltham Abbey, Essex; Cellgrave Co., Ltd., Godman Road, London, S.E.15; Crystalate, Ltd., Mill Lane, Tonbridge, Kent; London Moulders (Plastics), Ltd., 364 Buckingham Avenue, Trading Estate, Slough, Bucks, and U.K. Plastics, Ltd., Hook Rise, Kingston By-pass, Surbiton, Surrey.]

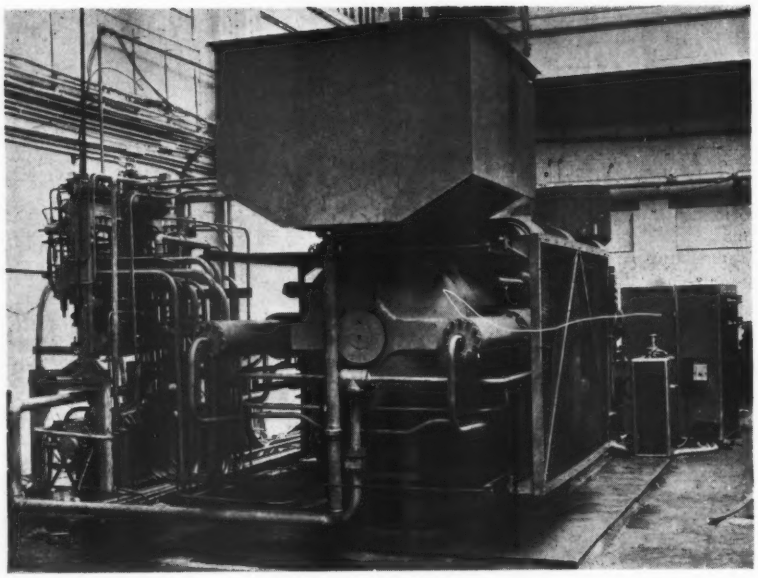
Lay Flat Tubing

SIR,—We are interested in the following item, polythene seamless flat tubing, .0015 gauge thick, size 10 in. through 27 in. wide to be used in the manufacture of plastic bags.

We would very much appreciate your indicating to us several British manufacturers who could supply us with this type of tubing.

FISKEMA.

63 Place de Verdun,
Casablanca,
Morocco.



Peco 160 oz. Injection Moulding Machine

The following details have just come to hand of what is believed to be the largest injection machine ever to be built outside the United States.

The 160 oz. press in the final construction phase.

As a result of three years' development work, The Projectile and Engineering Co., Ltd., the makers of the well-known Peco range of injection-moulding machines, have now fully developed a machine of 160 oz. shot capacity, which is considered to be the largest machine built outside the United States.

The injection-moulding technique has developed very rapidly since the war, with the availability of a wide range of thermoplastic materials, and there is a trend towards larger and larger machines. In the United States machines up to 400 oz. capacity have been built and a very considerable number of machines over 100 oz. capacity are in daily production.

The development of large injection-moulding machines of over 100 oz. capacity should not be considered purely as a scaling-up of smaller machines. The increased demand for large area mouldings with relatively thin wall thicknesses imposed certain moulding problems which had to be overcome. The elimination of internal stresses in such mouldings is only possible by careful control of moulding conditions. Such control is also essential in order to maintain dimensional accuracy. The material must be heated very carefully to achieve a high degree of homogeneity and to reduce material temperature fluctuations to a minimum. The mould must be filled very quickly to avoid premature chilling and cavity pressures have to be kept within very close limits.

In order to obtain accurate control of temperature and pressure and very high rate of injection, the principle of pre-plasticizing has been developed, where the material is heated in a separate heating chamber before being transferred to an injection cylinder. This injection cylinder holds the plasticized charge of material at a predetermined temperature and is subsequently injected into the mould. With this system, pressure losses between the injection plunger and the nozzle are practically eliminated. Thus, lower injection pressures can be used and for a given power input rate of injection can be greatly increased. The thermal efficiency of the plasticizing chamber can be considerably increased, since the pressure losses which influence the design of the heating unit become of minor importance.

The flow of plasticized material at high pressures within the pre-plasticizer system has brought about many technical problems. In order to overcome them, a complicated arrangement with hydraulically operated plungers, shut-off valves, electrical relays, etc., had to be devised, and in practice it has been found that injection units with pre-plasticizers tended to be sensitive, requiring usually much more maintenance and attention than conventional injection-moulding machines.

The Projectile and Engineering Co., which has a large development department devoted to the investigation of injection-moulding problems, has built several experimental pre-plasticizers and has finally developed an "in-line" pre-plasticizer. This possesses the high standard of efficiency required for this type of equipment, whilst the simplicity of design ensures operational reliability and minimum maintenance.

Essential Requirements

The essential requirements for a machine of over 100 oz. capacity are large platen area, large daylight and long mould-opening stroke. These features, combined with a high locking force, should enable the moulder to produce a wide variety of mouldings, such as large-area thin-wall sections, deep-draw mouldings, or mouldings which have heavy wall thicknesses. In addition to this, the machine must be able to accommodate different mould heights. Controls must be provided to permit the adjustment of mould-opening stroke, and mould-opening and closing speeds. The two latter controls will enable the moulder to obtain the optimum speed conditions during mould closing, mould parting and ejection.

After very careful consideration of the above requirements a direct hydraulic mould-locking unit has been designed with a maximum hydraulic pressure of 4,500 p.s.i. Towler Bros. (Patents), Ltd., who have wide experience in this field of hydraulics and enjoy a high reputation for reliability, have supplied the hydraulic power and control equipment for operation of this unit. A prefill system is incorporated in the main hydraulic cylinder to permit high-speed operation of the mould ram. To take advantage of the maximum platen sizes, one of the tie-bars is easily removable to facilitate the installation of large moulds.

In the case of moulds with small overall height, the mould-closing and opening stroke can be easily adjusted, thus reducing idle time to the minimum. The closing ram is provided with a 24-in. removable spacer.

Specification

The specification of the die-locking unit for this machine is as follows:—

Clamping force (maximum)	1,165 U.S. tons 1,041 U.K. tons
Maximum locking pressure (hydraulic)	4,500 p.s.i.
Opening force ...	100 tons
Closing speed ...	10 in./sec.
Opening speed ...	11.9 in./sec.
Closing time (36-in. stroke)	3.6 sec.
Opening time (36-in. stroke)	3.0 sec.
Platen size	60 in. by 60 in.
Mould space	60 in. by 35½ in.
Mould-closing stroke...	36 in.
Minimum mould height (with spacer)	12 in.
Minimum mould height (without spacer)	36 in.
Maximum daylight (without spacer) ...	72 in.

As already mentioned above, the injection

unit is provided with a patented Peco "in-line" pre-plasticizer, the principle of which is as follows:—

A long heating chamber is supplied with granular material from the hopper by a conventional material-feed device. The pre-plasticizing plunger, which transfers the material from the heating chamber to the injection chamber, operates at a pressure of 10,000 p.s.i.

Heating Efficiency

In order to increase the efficiency of heating, the chamber has been made considerably longer than usual. With normal heating chambers there are length limitations due to the excessive pressure drop in the heating chamber and the difficulty of controlling pressure at the nozzle. With a pre-plasticizer this difficulty is non-existent as the plunger pumps the material into the injection chamber and, therefore, pressure drop and pressure fluctuations in the heating chamber have no effect on cavity pressures.

The nozzle in the heating chamber is designed as a plunger with a long, heated passage having a small, non-return valve orifice at the end. The material is pumped through this into the injection transfer chamber, which is co-axial with the heating chamber and is fixed to a hydraulically operated crosshead. A further advantage of this system is that the material is reduced to a small cross-section when it is pumped through the long, heated passage, thus ensuring even heat distribution and mixing of the material. Injection into the cavity takes place with the whole heating chamber acting as a plunger and moving forward against the stationary injection transfer chamber. After the necessary holding-on period, a further charge of material is pumped from the heating chamber into the injection transfer chamber, moving the whole heating-chamber assembly back to its original position.

This type of construction is, of course, extremely simple and has the very great advantage that the transfer plunger and transfer chamber are always at sensibly the same temperature. Heat flow along the plunger extension of the heating chamber ensures this and allows close tolerances to be maintained without risk of seizure or contamination.

Capacity

The specification of this Peco injection unit is as follows:—

Ounces moulded per shot	120-160 oz.
Volume moulded per shot	200-300 cu. in.
Plasticizing capacity per hour*	250 lb.
Total force on plunger	336,000 lb.
Speed of injection plunger	3.55 in./sec.
Pre-plasticizer transfer pressure ...	10,000 p.s.i.
Capacity of feed hopper	500 lb.

* Subject to material and mould construction.

It will be noted that in the specification the shot capacity in ounces varies between 120 oz. and 160 oz. The shot capacity is dependent on the diameter of the transfer plunger and its stroke. The total force on the plunger itself divided by the area of the plunger results in the specific injection pressure.

Maximum injection pressure required depends not only upon the material, but also upon the shape of the moulded article, and it may vary between 6,000 and 14,000 p.s.i. At comparatively low cost, therefore, with a given injection unit, various injection pot and plunger sizes can be provided which will enable the moulder to select the optimum shot capacity, together with injection pressures and speeds, to suit individual moulding conditions.

When studying the specification of an injection unit fitted with a pre-plasticizer, the most important considerations are:—

Total force on injection plunger ...	336,000 lb.
Speed of plunger ...	3.55 in./sec.

These figures determine the total power available for injection and can be utilized to the best advantage by the selection of plunger sizes to suit individual requirements.

Plasticizing Capacity

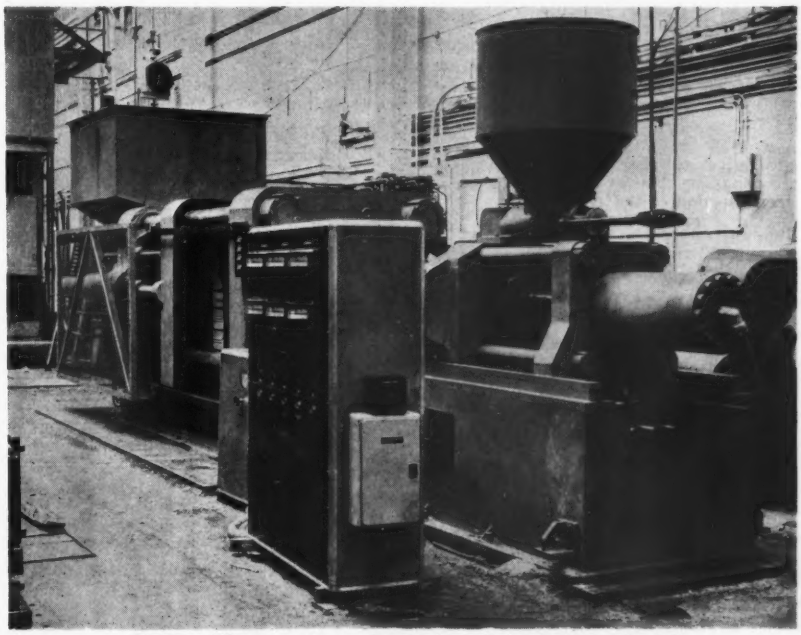
Turning now to the plasticizing capacity, of the injection unit, it will be noted that this had been specified, subject to material and mould construction. It should be appreciated that the specific heat and thermal conductivity of different materials vary. Thus, the heating time and surface area required to transfer rapidly a given amount of heat into the plastic will vary with materials. Moreover, the type of moulding to be produced will determine to what extent moulding conditions will be affected by the plasticizing efficiency. A mould with a projected area of 750 sq. in. and wall thickness of .100 in. in high-impact polystyrene would require a much higher degree of homogeneity of temperature distribution than, say, a polythene container with a wall thickness of .25 in. The maximum plasticizing capacity cannot be stated as applicable for every job.

Colour Changing

The Peco pre-plasticizing unit has been designed in such a way that material and colour change can be achieved with the minimum inconvenience. There are two hydraulic carriage cylinders which hold the nozzle to the sprue bush at a certain predetermined load. These cylinders are also used to effect a sprue break movement and to withdraw the injection unit for purging. The provision of this retraction movement also facilitates the withdrawal of the sprue from the rear of the platen, which in some instances may be a great advantage.

In addition to the above features, the volume shot capacity can be easily and accurately adjusted to suit the requirements of each moulding. The unit is also fitted with the Peco Packomatic compensator, which reduces the injection pressure at a predetermined rate at the end of the injection stroke during the mould-packing period, thus reducing internal stresses in the moulding.

These notes have been prepared and supplied by the technical staff of Peco Machinery Sales (Westminster), Ltd., the sales organization of the Projectile and Engineering Co., Ltd.



The first 160-oz.-capacity machine to be built by the Projectile and Engineering Co., Ltd., nears completion at the company's Battersea works. In the foreground is the control panel.

A FLANGELESS PIPE CONNECTOR

The new coupling has been designed for the connection of plastics piping and has proved to be both simple in fixing and capable of withstanding pressures superior to those laid down by the British Standards Institution for the piping. The couplings are being made by High Pressure Components, Ltd., in a variety of plastics materials to suit different applications.

THE advent of any new material, new process or new application of an existing material brings with it a host of minor problems, which, in their turn have to be solved. It would be wrong to say such problems are often overlooked because of their minor nature, for it is often on their solution that an even greater potential is realized.

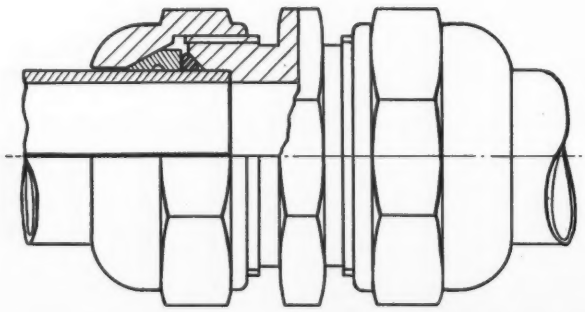
The arrival of plastics piping on a large scale presented many of these problems before it could be successfully employed in applications where its properties so obviously indicated its use. One of these problems was the design of a successful method for pipe coupling either to a second section of pipe or to a valve or other joint. Welding at first seemed the obvious solution but the disadvantages of the permanency of the coupling and the not inconsiderable skill required in making it has limited its use. Flange couplings appear to offer one solution and have been successfully adopted, but nevertheless there seemed room for further development in this field and several large companies have designed their own methods of coupling; methods which have now been adopted in many applications with considerable success.

High Pressure Components, Ltd., Sunflex Works, Colham Mill Road, West Drayton, Middlesex, whose work in the field of pressurized couplings, connectors and valves is well known, considered this problem in the light of their experience in metal. The idea which looked the most promising was the split collet method which had been used for butt jointing metal pipes. The principle on which this type of connector works is that a collet is held between the outer sleeve and union body. A taper on the internal face of the sleeve transmits pressure through the taper on the collet thus contracting it. At the same time the thrust supplied by the screw thread of the sleeve and union body is transferred down through the rubber sealing ring and also provides the contracting force for the collet. From this it will be seen a very firm nip is obtained and in addition an effective seal is made.

Original development work on this connector was carried out in metal alloys but it was later decided to experiment with nylon for the sleeve and union body. This has proved very successful and plans are in hand for the injection moulding of the parts. The reduction in costs afforded by this method of manufacture will be considerable plus the high rate of production for what will obviously be a very popular component. It is also anticipated that production of these parts in p.v.c. and polythene for use with piping in these materials, where chemical resistance is required, will be undertaken soon. The only part remaining in metal will be the collet but this is effectively sealed from corrosion and chemical attack by the sealing ring which can be made from various materials besides rubber.

Tests so far carried out have shown no weaknesses in the connector and high-pressure tests have fractured the tube in all cases before the connector has burst. The connector is available in a range of sizes to suit tubing from $\frac{3}{16}$ in. to 6 in. outside diameter and can, besides plastics material, be made in light alloys, steel and brass.

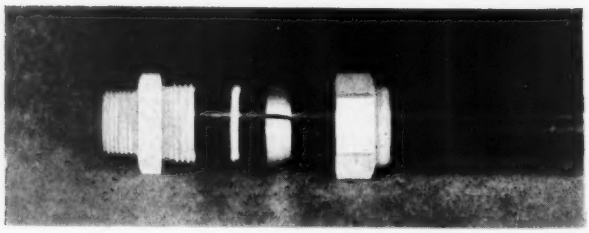
(Right) A cut-away drawing of the coupling showing the action and function of the collet and sealing ring.



(Top left) A union body in p.v.c. for $\frac{1}{2}$ in. outside-diameter piping.

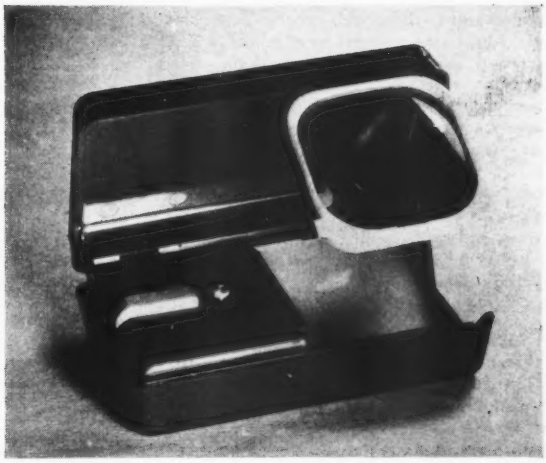
(Below) The parts of the coupling are shown. These are for stud fittings.

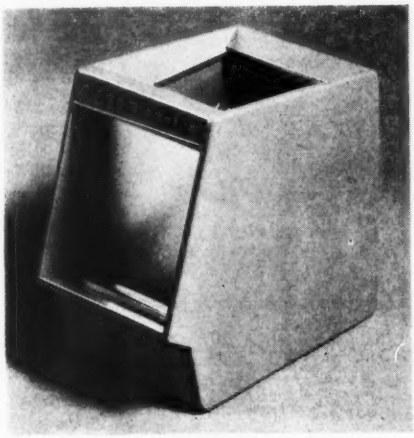
(Below) The parts as they are assembled on the pipe. This again is a stud fitting.



New Productions

The illuminated pocket viewer (right) moulded in polystyrene provides a good example where the design is an excellent combination of the functional and decorative in the use of plastics materials.





On the left is a large screen focus finder also moulded in polystyrene. This and the pocket viewer are injection moulded by British Artid Plastics, Ltd, for R. F. Hunter, Ltd.

The junction box illustrated below has been moulded in glass fibre reinforced polyester material by Universal Metal Products, Ltd. Its size is 32 in. by 26 in. by 10 in.

Illuminated Pocket Viewer

An extremely ingenious, compact and efficient pocket viewer has been produced for R. F. Hunter, Ltd., 51-53 Gray's Inn Road, London, W.C. The unit consists principally of a translucent Perspex screen illuminated from below by a 2.5v. bulb connected to batteries housed alongside the screen. Fitted to the lid is a magnifying lens which folds under when the lid is closed. A metal clip holds the lid at the correct focusing distance. The case itself is injection moulded in two pieces in maroon polystyrene as also is the battery case lid. Cream polystyrene is used in the moulding of the lens holder and switch. The battery lid is held in position by a knurled screw fitting into an integrally moulded brass insert in the base. The whole is very sturdily constructed as well as being efficient in use. The moulding and assembly of the viewer are being done by British Artid Plastics, Ltd.

Focus Finder

Also being moulded and assembled by British Artid Plastics, Ltd., for R. F. Hunter, Ltd., is the Paterson large screen focus finder. This also is injection moulded in polystyrene. The focus finder works by placing it on the focusing board of the enlarger so that the light passing through the negative and lens of the enlarger is thrown on to the mirror incorporated in the finder. This in turn reflects the image on to the ground glass screen with great clarity.

Junction Box

A large junction box produced by Universal Metal Products, Ltd., Langley Road, Salford 6, Lancs, is illustrated. Measuring 32 in. by 26 in. by 10 in., it has been moulded in polyester/glass fibre laminate by the matched metal moulding tool technique. Also of glass reinforced plastics are the ribs holding the terminals and the fixing brackets. Besides having good electrical and thermal insulation properties, polyester/glass fibre structures have high strength and low weight characteristics as well as being resistant to corrosive attack.

P.V.C. in Dry Batteries

The Ever Ready Batrymax H.T. layer-cell battery which is illustrated on this page incorporates extruded Vybak material in its construction. Each cell in the battery is sealed into a strip of this p.v.c. tubing, which acts as a mechanical seal to hold the components together. Another important function of the p.v.c. is to act as a moisture barrier. The moisture content of the cells has to be carefully controlled and maintained for the efficient working of the battery. Transparent tubing has been used in preference to opaque to facilitate inspection of the cells.

Vybak p.v.c. compounds are manufactured by Bakelite, Ltd.

The use of p.v.c. extruded tubing in the construction of H.T. layer-cell batteries is illustrated above. It acts both as a mechanical seal and as a moisture barrier and the transparency of the material facilitates inspection.

Speedometer for Boats

From America comes the idea of a portable speedometer known as the Speed-Wand. It works on water pressure provided by the forward motion of the boat and consists principally of a graduated tube moulded in Tenite butyrate. When the inlet is submerged in the direction of travel, a column of water enters the tube and on withdrawal is held by means of a bronze check-ball, thus enabling a reading to be obtained against the scale. The scale is graduated from 5 to 35 miles per hour (it is not stated whether these are nautical or statute miles). Tenite butyrate is marketed by Eastman Chemical Products, Inc., Kingsport, Tennessee.

The Speed-Wand illustrated on the right is an American idea for giving the approximate speed of a boat through the water. It is constructed from Tenite butyrate.

Plastics Dinghy

Designed to accommodate four persons the glass fibre/polyester dinghy which is illustrated on this page has been designed by Mr. E. Campbell, of Windermere, and produced under the direction of Mr. J. B. Haughton, of Blackpool. The hull is designed to provide triple stress resistance, being made up of three laminates giving a total weight of 4½ oz. per square foot. The gunwales, beading and seats, engine housing and foredeck are of wood, giving the dinghy an orthodox appearance, and it is powered by a Stuart Turner 1½-h.p. engine. The wooden keel and stern-tube are moulded into the hull and there is a cut-away aft to locate the propeller under the transom. The overall length of the dinghy is 11 ft., the beam 4 ft. 11 in., and the draught 1 ft. 3 in.

The construction of the dinghy below is of polyester reinforced with glass fibre. The gunwales, foredeck and the seats are of wood and it is powered by a 1½-h.p. motor.

Plastics NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

HUNGARIAN PLANT TO PROCESS NATURAL GAS.—Biggest investment of Hungary's next Five Year Plan, due to commence next year, will be the Tiszamenti Chemical Combine, which is to process natural gas piped from Rumania on a 700-acre site beside the River Tisza.

The 220-mile pipeline, of which 80 miles will be on Hungarian territory, is being built jointly by the two countries under a mutual-aid agreement negotiated a few years ago.

Products of the chemical works will fall into three main groups: (1) P.v.c. plastics; (2) "Pan" (poliakrilnitril), a synthetic-wool thread, considered to be better than wool. By mixing it with wool, Hungary plans to increase her cloth production by 400 million metres a year; (3) Fertilizer.

Other products will include synthetic ethylalcohol—for which at present large quantities of potatoes are diverted—caustic soda, dyes, basic materials for drugs and gas for other industries nearby.

SYNTHETIC GLYCEROL PLANT.—Work will shortly begin on the construction of the first synthetic glycerol plant in Europe—the only one outside the U.S.A. Costing approximately £2½ million, it will be built at the Shell refinery at Pernis, near Rotterdam, in Holland, and is expected to be in operation towards the end of 1957.

Research carried out by Shell at Emeryville, California, led to the erection of a plant soon after the war for the synthesis of glycerol from propylene, where it has been manufactured for several years.

Before this development, glycerol could only be obtained as a by-product of the soap or the fatty-acid industries. The commercial establishment of a synthetic process in Europe will provide a new and reliable source of supply for users of glycerol.

Plans are being made by the Shell Chemical Corporation for the construction of another synthetic glycerol plant in the U.S.A.—at Norco, Louisiana, near New Orleans.

TECHNICAL PUBLICATIONS.—British Geon, Ltd., have issued four new technical leaflets on their polyvinyl materials. These are on vinyl resins and latices, vinyl compounds, The Effect of Temperature and Orientation on the Mechanical Properties of Plastics, and Vinylidene chloride copolymers.

British Industrial Plastics, Ltd., have published a leaflet showing, pictorially, a method of laying up by hand polyester glass fibre laminates.

VINYL STABILIZERS HANDBOOK.—Pure Chemicals, Ltd., Plastics Division, Kirkby Industrial Estate, Nr. Liverpool, have published a handbook on their Ferroclere vinyl stabilizer. This book has been compiled with the object of systemizing the knowledge currently available on the subject of compounding p.v.c. with chemical stabilizers. It deals comprehensively with many of the problems which have been encountered in the compounding field.

BOOKLET ON POLYSTYRENE.—Monsanto Plastics, Ltd., have produced a very colourful and elegant booklet dealing with the merits and properties of Lustrex polystyrene. More detailed information on moulding techniques and finishing can be found in their technical service bulletins, synopses of which are given.

BAKELITE EPOXY RESIN.—Advance information on the properties of the various grades of epoxy resin marketed by Bakelite are now available. Also available are information sheets on polystyrene monofilaments. These can be obtained from 12/18 Grosvenor Gardens, London, S.W.1.

INDEX TO TECHNICAL PUBLICATIONS.—Imperial Chemical Industries, Ltd., Dyestuffs Division, have prepared the second edition of the Subject Index to their recent technical publications.

TRADE PROSPECTS IN PANAMA.—Opportunities for United Kingdom exporters to increase their trade in a market where almost anything apart from capital goods can be sold are outlined in the Economic Survey for Panama by Mr. E. A. Clough, recently H.M. Ambassador at Panama City. Copies can be obtained from H.M. Stationery Office, price 1s. 0d. (by post 1s. 7½d.).

HEAT TREATMENT JOURNAL.—Compiled by Wild-Barfield the third issue contains notes on gas carburizing, a new hardening unit and vitreous enamelling in electric furnaces.

NEW REDUCING VALVE.—An improved type of pilot-operated reducing valve—known as Class "G3"—has been introduced by Sir W. H. Bailey and Co., Ltd., Albion Works, Patricroft, Manchester, to meet the demand for a valve which will deliver a constant reduced pressure irrespective of fluctuations in the inlet or boiler pressure; will deal with variations in the demand or quantities of steam being used and can be tightly closed when steam is not required.

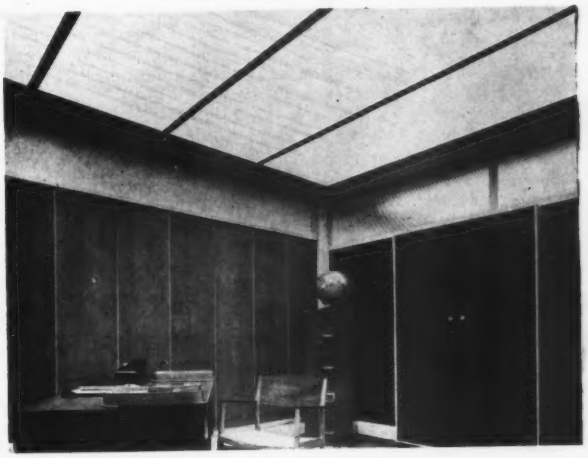
The new Class "G3" reducing valves supersede the previous "G2A" series and the improvements include a larger phosphor-bronze diaphragm, which can deliver steam at reduced pressures between 1 and 125 p.s.i.; forged bronze or steel alloy pilot-valve top; an austenitic stainless-steel pilot valve and a nickel-alloy seating. To minimize the danger of distortion to the valve body through pipe strain, a new piston and piston chamber have been fitted.

Maintenance is simplified as the "G3" is more easily assembled, and the spring chamber and pilot valve are more accessible for inspection. The separate pilot-valve strainer can be examined, if necessary, without dismantling the spring chamber top. A patented feature is a device that enables the valve to be changed over to remote control without breaking the cover joints.

The new valve is fully described in a new "G3" brochure obtainable from the company.

LONDON OFFICES.—Lumenated Ceilings, Ltd., a subsidiary of Thermotank, Ltd., moved into new London offices at Alliance House, Caxton Street, London, S.W.1, and, at the same time, gave a report of the progress the company has made in its first year of trading. The ceiling, which is made from corrugated vinyl sheeting suspended below fluorescent lights, appears to have been well received. The largest installation so far completed covers approximately 7,400 sq. ft., the smallest 18 sq. ft. Experiments are now being carried out to incorporate heating and ventilating behind the ceiling.

Two new members have been appointed to the board of directors, Mr. I. D. Cameron, formerly technical manager, and Mr. D. McCullough.



Part of the Lumenated ceiling installed in the managing director's office at the new London offices of Lumenated Ceilings, Ltd.

Sir Patrick Branigan

SIR PATRICK BRANIGAN has recently joined the board of Suflex, Ltd., as chairman of the company. Mr. H. S. Payman has been appointed general manager.

DR. J. T. McCOMBIE has been appointed general sales manager of the British Industrial Solvents Division of The Distillers Co., Ltd.

SIR GRAHAM HAYMAN assumed the presidential office of the Association of British Chemical Manufacturers at the annual general meeting last month. Mr. G. F. Williams succeeded Mr. W. J. Worboys as chairman of the Association.

MR. D. E. WEBB has been appointed a director of Expandite, Ltd.

MR. E. BRUCE BALL has joined the boards of Sentinel (Shrewsbury), Ltd., Fawcett, Preston and Co., Ltd., Finney Presses, Ltd., and Ferrous Castings, Ltd.

MR. G. P. BELSHAM has been appointed managing director of Brookhirst Switchgear, Ltd., Chester.

MR. H. W. KING.—At the recent Cliftonville conference of the Purchasing Officers' Association, Mr. H. W. King, the purchasing director of Eburite Corrugated Containers, Ltd., was elected president of the Association for 1955-6. In his opening address, Mr. F. J. White, the retiring president, in commenting on large stocks held by manufacturers, said that this was probably due to current marginal shortage of some materials, unreliability of deliveries and uncertain service from the railways. A sample survey showed that approximately 53% of the original promises given by suppliers are not kept and 39% of revised promises also fail.

APPOINTMENT TO DESIGN COUNCIL.—The Board of Trade announce that the President has appointed Mr. A. Everett Jones to be a member of the Council of Industrial Design.

MR. DAVID BRIDGE.—It is with regret that we hear of the death of Mr. David Bridge (Jnr.), chairman of the directors of Carter Brothers, Ltd. He was associated for 34 years with the family firm of David Bridge and Co., Ltd., resigning when it became a public company. Mr. Bridge was 51 years of age.

MR. PERCY RICHARDSON.—It is with regret that we hear of the death of Mr. Percy Richardson, director and late chairman of Foster, Yates and Thom, Ltd.

BAKELITE POLYTHENE.—Two polythene resins and two derivative polythene compounds are now being marketed by Bakelite, Ltd. These include resin DYNH, which is a general-purpose material for injection moulding, pipe and electrical applications, and compound DE-2400, a hot homogenized DYNH which is similar in properties to the parent resin, but which is superior in its extrusion qualities and in its freedom from fish eyes; this compound is designed for high-quality injection moulding.

The other two grades are resin DYNF, which has a lower average molecular weight than DYNH and is intended for injection moulding or for extrusion where a softer grade of material is required, and compound DE-2300 (hot homogenized DYNF). This has better extrusion properties than its parent resin and gives fewer fish eyes; it is designed for extrusion lamination, but it is also suitable for injection moulding.

PRICE REDUCTION.—As a result of the production of Terylene at Wilton, I.C.I. announce the reduction in price of the fibre and yarn. The amount of reductions vary from 6s. per lb. on the higher-priced filament yarn to 1s. 6d. per lb. on the 1½-denier staple fibre.

MESH FILTERS.—The Knitted Mesh Manufacturing Co., of 36 Victoria Street, London, S.W.1, is producing filters and pads woven from various plastics materials. These include nylon, p.v.c., polythene, Saran, Courlene, Perlon and Grilon.

JOHN DALE, LTD.—A proposition was put forward by the directors to the shareholders of John Dale, Ltd., whereby it was proposed to increase the capital of the company by the issue of £250,000 convertible unsecured loan stock 1958-65. It is hoped that employees will participate in this investment through a new scheme recently introduced by the directors.

SHARE ISSUE.—At an extraordinary general meeting held on November 8, it was proposed by the directors of Bakelite, Ltd., to increase the capital to £3,000,000 by the issue of 1,000,000 redeemable, cumulative preference shares of £1 each. The additional capital is to be used to increase the productive capacity of its thermosetting and laminating plant, to install plant for the compounding of polythene resins and to extend the vinyl resin plant.

CHANGE OF ADDRESS.—M.C.M. (Tools), Ltd., have moved to a new factory at 715 Kings Road, Kingstanding, Birmingham, 22c.

CHANGE OF ADDRESS.—East Anglia Plastics have moved from Aycliffe and are now situated at Temple Works, Knight Road, Strood, Kent, telephone number Strood 7416.

RESEARCH SCHOLARSHIPS.—Courtaulds, Ltd., have granted over £6,000 in post-graduate research scholarships, the majority of which is supporting research in fields directly connected with the plastics industry.

P.I.G.S. RESULTS.—The results of the Plastics Industry Golfing Society meeting, held at West Hill Golf Club on Thursday, October 13, are published below.

Airborne Trophy (Stableford Bogey Singles): Winner, R. F. Johnson (6), 38 points; runner-up, P. L. W. Morton (18), 37 points.

Cyril Last and Major Knowles Trophies (Stableford Bogey Foursomes): Winners, F. A. Garrett (4), P. Morgan (24), 33 points; runners-up, J. G. H. Jamieson (11), C. J. French (22), 31 points.

FORMICA CONVENTION.—Thomas De La Rue and Co., Ltd., held an international convention at their Tynemouth factory which was attended by technicians and salesmen of the organization from six countries.

DINNER AND DANCE.—The London Section of the Oil and Colour Chemists' Association are holding their annual dinner and dance in the Grand Hall at the Criterion Restaurant, Piccadilly, London, W.1, on Friday, December 2.

Printed application forms are being sent to London Section members. Other members wishing to attend should apply to Mr. H. C. Worsdall, the Hon. Sec. London Section.

The Jensen leads the parade of cars having glass-reinforced plastic bodies at a meeting held at Brands Hatch last month.

(Left) H.R.H. The Duke of Edinburgh talking to Mr. H. Lusty on the Bakelite stand at Copenhagen.

(Right) The Duke examines and discusses with Mr. H. Brooks the glass fibre/polyester car body on the B.I.P. stand.

AT THE BRITISH EXHIBITION held in Copenhagen last month, the plastics industry was represented by about 30 companies. Among the exhibitors were Storeys, of Lancaster, who showed examples of their range of printed p.v.c. sheeting and p.v.c. coated fabrics. James Williamson and Son showed p.v.c. floor covering as well as various types of p.v.c. coated fabrics used for upholstery and wall-panelling, perambulators, etc.

British Geon and British Resin Products showed, on a combined stand, the complete range of plastics raw materials manufactured by these two D.C.L. plastics companies, together with typical examples of their applications. The Geon section of the stand was devoted to the uses of Geon p.v.c., whilst on the B.R.P. section were shown the applications of their range of synthetic resins sold under the trade names of Epok, Cellobond, Cellomold, Distrene and Rockite. The Geon part of the display was that used at Oslo last year, with one or two slight alterations, the B.R.P. section having been additionally constructed on the same lines.

On the I.C.I. stand the main features were devoted to p.v.c. leathercloth and the synthetic fibres Terylene and Ardil. Monsanto showed plastics compounding materials and their range of polystyrene moulding powders. British Industrial Plastics showed, among other things, the polyester car bonnet last seen at the British Plastics Exhibition.

An attractive stand was that of James North Export, Ltd., who displayed industrial protective clothing and foul-weather clothing made with their p.v.c. coated fabric. Also displayed were p.v.c. dipped gloves for industrial and domestic applications.

P.V.C. stabilizers and plasticizers were among the exhibits found on the stand of Albright and Wilson, whilst Erinoid, Styrene Product and Utilex showed, on one stand, their range of plastics materials, including cellulose acetate and polystyrene.

Bakelite, Ltd., showed their range of phenol, urea, alkyd and polyester resins as well as several products based on p.v.c. Michael Nairn were another company showing floor covering in the form of vinyl tiles. Different types of plastics film were displayed by British Cellophane. These included cellulose acetate, polyethylene and cellophane.

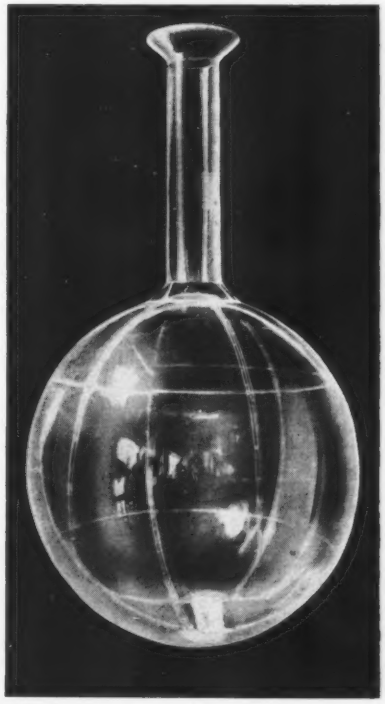
Permanoid shared a stand with other members of The Radio and Electronic Component Manufacturers' Federation. They showed p.v.c. sheathed and insulated cables. Various synthetic fibres, including nylon staple and yarn, and rayon staple and yarn, were featured by British Nylon Spinners and Lustre Fibres. Deeglas glass-fibre reinforcing materials were to be seen on the stand of Glass Yarns and Deeside Fabrics, Ltd. P.V.C. conveyor belting was shown by British Belting and Asbestos, Ltd.

FORMED PERSPEX.—Forming the centre-piece of the I.C.I. stand at the Copenhagen Fair was a large round-bottom flask fabricated from Perspex sheet. The flask was 11 ft. high with a circumference of 19 ft. and was fabricated by Williaam J. Cox, Ltd., 559-561 Holloway Road, London, N.19, for McCutchon Studios. The bowl of the flask is made up from 18 panels each accurately formed so that on assembly a complete sphere was produced. Jointing was effected by internal ribbing and riveting so that the display could be easily transported.

Williaam J. Cox, Ltd., who specialize in forming Perspex and only Perspex, produced their first article in 1938, and can therefore claim to be one of the oldest firms in this branch of the plastics industry. During the war they were responsible for production of

(Left) Mr. C. Glassey and Mr. Wilster, B.I.P. agent and representative in Copenhagen, on the B.I.P. stand.

(Right) The Perspex round-bottom flask which formed the centre-piece of the I.C.I. stand at Copenhagen.



a great many aircraft canopies and in particular that, in one piece, used on the Mosquito. Peacetime has turned their activities to more constructional applications and they now specialize in Perspex roof lights and all types of industrial, scientific and display shaping.

PLASTICS IN CARS.—Reports from the Paris Motor Show indicate an increasing use of plastics in motor engineering. Besides the new Citröen which was shown for the first time there and which has a roof section constructed from plastics material there were other applications on the mechanical, rather than the coachwork, side. These items included cams, piston rings, gearwheels and valve seats which are being made in nylon, and diaphragms and filters for petrol pumps, which are formed in p.v.c. Another French car which has adopted the reinforced plastics body is the new Renault, the body of which weighs less than 440 lb. It is interesting to note that at the Earls Court Motor Show the Singer cars were not shown with plastics bonnets this year.

"Plastics in the Service of Man"

The following is a list of full names and addresses of companies mentioned in the illustrated feature, "Plastics in the Service of Man," which appears on pages 380 to 382 in this issue:—

61. Plastics in the Bathroom—II

B.X. Plastics, Ltd., Higham Station Avenue, London, E.4.
Bextrene—B.X. Plastics, Ltd.
Crystalate, Ltd., Mill Lane, Tonbridge, Kent.
Evered and Co., Ltd., Surrey Works, Smethwick, 40, Staffs.
Formica—Thos. De La Rue and Co., Ltd., 84-86 Regent Street, London, W.1.
Kleemann, O. and M., Ltd., West Halkin Street, Belgrave Square, London, S.W.1.
Kleestron—O. and M. Kleemann, Ltd.
Marley Tile Co., Ltd., London Road, Riverhead, Sevenoaks, Kent.
Phoenix Rubber Co., Ltd., 2k Buckingham Avenue, Trading Estate, Slough, Bucks.
Thermo-Plastics, Ltd., Luton Road Works, Dunstable, Beds.
Universal Metal Products, Ltd., Langley Road, Pendleton, Salford, 6, Lancs.
Velbex—B.X. Plastics, Ltd.
Warerite—Warerite, Ltd., Watton Road, Ware, Herts.

MEETINGS

November

10th.—Annual Luncheon. Plastics Institute, London Section. Criterion Restaurant, London, W.1.

14th.—"A Theory of Drying Sheet Materials using Heated Cylinders," A. H. Nissan. Society of Chemical Industry, Chemical Engineering Group. Bradford Technical College. 7 p.m.

14th.—"Ion Exchange Resins," T. V. Arden, B.Sc., Ph.D., F.R.I.C. Royal Institute of Chemistry, Woolwich Polytechnic, London, S.E.18. 6.45-7.30 p.m.

15th.—"An Assessment of Dry Blending Equipment," F. E. Adams and A. G. Baker. The Institution of Chemical Engineers, Geological Society, Burlington House, London, W.1. 5.30 p.m.

Members of the Plastics Institute leaving London Airport to visit the Dusseldorf Plastics Exhibition.

16th.—"Recent Developments in Pressure Vessel Construction," S. H. Griffiths. The Institution of Chemical Engineers, North-Western Branch, Leeds, The University. 7 p.m.

16th.—"An Historical Survey of Plastics," J. H. Collins, B.Sc., F.R.I.C. Plastics Institute, Western Section. Technical College, Stroud. 6.30 p.m.

16th.—"Shock Curing of Laminates," L. Welch. Plastics Institute, North-Eastern Section. 7 p.m.

17th.—"Recent Developments in Polyester Resins," E. M. Evans, Ph.D., B.Sc., A.R.C.S. Oil and Colour Chemists' Association, Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1. 7 p.m.

17th.—"Problems Associated with the Use of Plastics in High-speed Aircraft," M. G. Church, Ph.D., B.Sc., A.R.I.C., A.P.I. Plastics Institute, London Section, Wellcome Research Institution, 183-193 Euston Road, London, N.W.1. 6.30 p.m.

18th.—Dinner and Dance. Plastics Institute, South Wales and Monmouthshire Section, St. Mellon's County Club, Cardiff. 7.30 for 8 p.m.

18th.—"Making Metal Forming Tools and Jigs in Plastics," P. G. Pentz, B.Sc., Plastics Institute, Midlands Section. The James Watt Memorial Institute, Birmingham. 6.30 p.m.

21st.—"Extrusion of Plastics," Mr. Herchenbach and H. Reifenhauser. Plastics Institute, Midlands Section, Bell Hotel, Leicester. 6.45 p.m.

25th.—"The Impact of Silicones in the Plastics and Rubber Industries," M. C. Coates. Plastics Institute, North-Western Section, Engineers' Club, Albert Square, Manchester. 2. 6.45 p.m.

30th.—"Fluorocarbons and their Future," R. N. Haszeldine, B.Sc., Ph.D., M.A. Royal Institute of Chemistry, South-West Essex Technical College, Forest Road, London, E.17. 7 p.m.

December

1st.—"Principles and Practice of Polymer Design," R. B. Richards, B.A., B.Sc. Plastics Institute, Southern Section, The University, Southampton. 8 p.m.

1st.—"The Technology of Carbon and Graphite," J. M. Hutcheon. Society of Chemical Industry, Chemical Engineering Group. The University, Bristol.

2nd.—Ladies' Night. Oil and Colour Chemists' Association. Grand Hall, Criterion Restaurant, London, W.1.

2nd.—Fifth Annual Dinner - Dance. Plastics Institute, Western Section. Queen's Hotel, Cheltenham. 7 for 7.30 p.m.

6th.—"Second Order Transitions in High Polymers," Dr. M. Gordon. Society of Chemical Industry, Plastics and Polymer Group. Rooms of the Chemical Society, Burlington House, London, W.1. 6.30 p.m.

7th.—"Hard Nickel Electroformed Moulds," P. Spiro. Plastics Institute, Yorkshire Section, St. Mark's House, 186 Woodhouse Lane, Leeds.

7th.—"Phenolic Effluent Disposal," D. A. Hall. Institution of Chemical Engineers, N.W. Branch, The University, Leeds. 7 p.m.

8th.—"Surface Chemistry," Professor Sir Eric Rideal, M.B.E., F.R.S. Royal Institute of Chemistry, Battersea Polytechnic, Battersea Park Road, London, S.W.11.

14th.—Film Evening. Plastics Institute, North-Eastern Section, Eldon Grill, Grey Street, Newcastle upon Tyne.

14th.—"Polythene—The Future Outlook," A. Renfrew, B.Sc. Plastics Institute, South Wales and Monmouthshire Section. Angel Hotel, Cardiff.

give a dog a bad name

For too many people, plastics toys are bad toys. They break easily — and dangerously. In fact they're a dog with a bad name:

that's bad business!

play safe

— with Courtaulds' cellulose acetate. Toys made with this won't break in transit or in the nursery — can't break with sharp, jagged edges that will hurt a child. Parents like them — and buy them:

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KAISERLICHES PATENTAMT.

AUSGEGEBEN DEN 18. JANUAR 1915.

PATENTSCHRIFT

— № 281687 —

KLASSE 39*b*. GRUPPE 8.

CHEMISCHE FABRIK GRIESHEIM-ELEKTRON IN FRANKFURT A. M.

Verfahren zur Herstellung technisch wertvoller Produkte aus organischen Vinylestern.

Patentiert im Deutschen Reiche vom 4. Juli 1913 ab.

STAMM

This patent was the start

The HOECHST range of plastics comprises at present:

MOWILITH polyvinyl acetate	*furthermore as auxiliaries:*
MOVIOL polyvinyl alcohol	URESIN B
MOWITAL acetal of polyvinyl alcohol	TRICRESYL PHOSPHATE
HOSTALIT polyvinyl chloride	TRIXYLENYL PHOSPHATE
HOSTALEN low-pressure polyethylene	INFIRNOL
HOSTAFLON polytrifluorochloroethylene	WAXES FROM GERSTHOFEN
ASPLIT as compressed resin	CHLOROPARAFFIN

HOECHST

FARBWERKE HOECHST AG. *vormals Meister Lucius & Brüning* **FRANKFURT (M)-HOECHST**

TALKING SHOP . . .

Old Hands Learn How. Charles Waghorne, director of Insulators, sat in the front row at the first "Junior" lecture ever to be held by the London Section of the Plastics Institute. "Perhaps," he said, "I shall be able to learn something from this sort of meeting instead of the stuff we used to get at the lectures at the Waldorf."

Mr. Waghorne was not far off the mark since of a total audience of 140 which heard Kenneth Lawrence read an excellent paper, at least one third were well over the age group of Junior Members. Included were a party of 20 from E. K. Cole at Southend, a large contingent from Welwyn (I.C.I.) and many from the London offices of the raw material manufacturers.

Lawrence's paper was entitled "Moulding Processes Today" and speaking extemporarily for over one hour, he painted an accurate and comprehensive picture of the emergence of the large moulding organizations during the past 50 years. This kind of junior lecture is not only of the greatest interest to the young technicians of our industry but also to sales staff, demonstration personnel and others who do not come into daily contact with the manufacturing aspects of our work.

His lecture was illustrated by two films, the by now famous Styron film showing what happens during injection moulding, and an excellent production in full colour by the "Aims for Industry" organization, assisted by the F.B.I.

To clinch the audience's interest in the subject, the chair was taken by H. P. Bridge, managing director of British Moulded Plastics, Ltd., a veteran of the moulding industry, and witty as well as succinct in his comments.

★ ★ ★

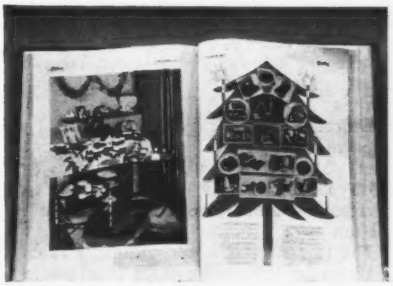
Plastics Facts and Figures. T. C. Corbett of I.C.I.'s Plastics Division read an interesting paper in September in which he forecast production figures for the next ten years. To anyone interested in this aspect of the Industry's development The Report on the Census of Production for 1951, Volume 2, sub-heading Plastics Materials, will be especially welcome. Published by H.M.S.O. it is priced 1s. 6d.

This publication throws some light on past history and for that reason is a welcome addition to the information we have available. It seems to me, however, that to publish in 1955 figures for our trade for the year 1951 is hardly an efficient attempt at providing the industry with a mass of essential information. It may be argued that the production of these figures is the proper function of the Federation but it is often not appreciated that the Federation represents only those members of the industry who choose to join; at present some 300 companies are represented, a fraction only of the total number of concerns in Great Britain who are actively engaged in the plastics industry. Any figures collected are only a guide and cannot be regarded as representing the industry as a whole. Another factor which causes me to regard this latest group of figures with some suspicion is the method by which the necessary information is obtained. Extensive forms are circulated to industrial undertakings every year and every company in this country is obliged, under some regulation or other, to complete these forms in considerable detail. There are, of course, the conscientious companies or those with time on their hands to make available the necessary facts. These I believe to be in the minority, however, since I am sure that a large number of companies think of a number, double it, subtract the day of the month and then ask a clerk to fill in the result. Most manufacturers complain bitterly that the amount of unnecessary form filling is a feature of this day and age. To get accurate figures, simpler forms are needed, restricted to the essential information. I submit that the latest S.O. publication contains a lot of figures which are of little or no value in assessing the true state of the industry. For example, after a long list of specific materials sold, we have a heading "Other Goods Sold and Work Done," representing a total value of £1¼m. Exactly what those goods were and what work was done for that sum of money the report does not state.

★ ★ ★

Patent Office Celebrates. Visitors to the world famous library at the Patent Office during recent weeks will have been surprised to find the severe Victorian architecture enlivened by a modern display of books, periodicals, and apparatus. In an air of restrained gaiety, the Patent Office is celebrating its hundredth year of existence.

The founder of this famous library can hardly have envisaged the scale of its development today, holding as it does one of the most complete stocks of technical and scientific periodicals, to say nothing of a handsome reference library.



First volume of "Plastics," open at pages 246 and 247.

The exhibition has been neatly arranged in stands which each cover a decade. Examiners have selected patents which they feel have most influenced the fields which they each cover with a result that virtually the whole of British technical progress can be seen in bird's eye form by the original patents on display. On one stand can be seen one of Baekeland's most important patents taken out in 1908.

Amongst the many Temple Press periodicals shown as indicative of the development of Britain's industry we were pleased to see *Plastics* opened at pages 246 and 247 for December, 1937.

★ ★ ★

Western Section Activities. From T. G. A. Evans, secretary of the Western Section of the Plastics Institute, I have received some interesting notes on another successful meeting, this time entitled "Plastics and Local Industry." Held at the Erinoid Clubhouse, the meeting was chaired by A. O. R. Johnson, and the president of the Institute, J. L. Daniels, was also present.

To an audience of over 70, experts of several manufacturing organizations in the West discussed the uses made by their companies of plastics materials. Represented were I.C.I., Hunt and Winterbotham, Permali, Edison Swan and British Cellophane.

This type of meeting strikes a new note since it enables the audience to see the very large coverage offered by the plastics industry and the committee of the Western Section are to be congratulated on their idea.

PLASTIKON.

The Patent Office Centenary Exhibition, seen from the first gallery of the library.

The Properties and Testing of Plastics Materials—Part 2 (Cont.)

Section 8. Tear Strength and Fatigue

By A. E. LEVER,* A.I.R.I., and J. RHYS,† M.Sc.

Plant and equipment to evaluate resistance to tearing and fatigue is described here

Tear Strength

THERE is a useful discussion on the subject of tear strength (1) divided into three groups:—(a) **Direct Tearing.** This group includes the methods of testing employed by Talalay (2), Zimmerman (3), Evans (4), Lefcaditis and Cotton (5) and Kusov (6). (b) **Tearing perpendicular to the direction of stretching.** This includes the methods of Winkelman (Crescent tear), Busse (7), van Wijk (8), Davies (9). (c) **Tearing of samples sliced in the direction of stretching.** The method of Partrikiev and Malnikov (1).

Different factors may influence the tear strength such as:—(a) Thickness of specimen. (b) Angle of cut. (c) Depth of cut. (d) Type of material. (e) Fillers. (f) Temperature of test. (g) Stress distribution in the test piece.

The tear resistance of vulcanized rubber is discussed (10) where three types of test are described:—(a) A razor-nicked crescent specimen (Slit 0.020 in.). (b) A similar crescent test piece but with tab ends. (c) An unnotched 90° Angle test piece.

In the British Specification for vulcanized rubber (b) is used (11), and (c) is specified for plastic film (12) (13).

Results are expressed as the pull in lb. required to tear a specimen 1-in. thick, e.g., if a load of 36 lb. is necessary to tear a specimen 0.082-in. thick then

$$\text{Tear resistance} \frac{36.0}{0.082} = 439 \text{ lb./in.}$$

There is also a good discussion of different methods (14) such as the crescent, angle and slit punched types of test pieces. It is suggested that, though they are all useful for laboratory comparisons, they should not be used as an indication of service behaviour.

To avoid the necessity of making a nick in the test piece, the angle test piece has been used (15). In this report there are some stress patterns shown of both the angle type and the crescent type.

Further discussions are given (16), and it is suggested that the angle method gives a measure of tear initiation, whereas the crescent type, and the I.G. type are tear propagation methods.

Comparisons of the Delft and angle tear methods are made (17). In the former, an incision is cut at the same time as the test piece.

The U.S. Dept. of Commerce uses the Elmendorf tear strength (18) for determining tear strength of p.v.c. sheet and film (19). This method uses a pendulum type of testing machine and test specimens are cut in a longitudinal direction 3-in. long by 2.5-in. wide, with a centre slit 0.8-in. long. The results are reported as the force in grams required to tear the specimen.

Another investigation used three methods:—(a) The Elmendorf method (18). (b) S.P.I.-A.S.T.M. static-weighing method (13). (c) S.P.I.-A.S.T.M. pendulum weighing method (13).

A cutter has been designed by I.C.I. Ltd. for accurately cutting the nick required in crescent tear specimen (21).

The crescent tear method is specified for non-rigid vinyl chloride-acetate plastics (20), and non-rigid vinyl chloride plastics (22), but the angle test piece is used in a specification covering plastic film and sheeting in general (13).

In testing "resin rubber" soling on the S.A.T.R.A.-Hall Flexing machine it is necessary to pierce the test piece to initiate a crack for studying crack-growth. A jig for piercing the test pieces is described (32).

Fatigue

Fatigue is a general term used to describe the behaviour of materials under repeated cycles of stress or strain which cause a deterioration of the material resulting in a progressive fracture (23). It is dependent on frequency, amplitude, temperature, stress and mode of stressing.

Vibratory or continuously variable loads applied to any material will cause failure even though the stress may be well within the ultimate static strength of the material. A small number of cycles of stress will cause failure if the applied stress is near to the ultimate static strength.

Some materials will sustain vibratory loads indefinitely provided the stress does not exceed a certain critical value, known as the "fatigue limit." This value may be greater, or less, than the elastic limit, and often lies between $\frac{1}{3}$ and $\frac{1}{2}$ of the tensile strength at break.

The behaviour of materials under repeated stress is usually represented by a "stress number" curve, with the stress as ordinate and the number of cycles producing fracture as the abscissae. The curve starts at the stress corresponding to the static ultimate strength and slopes downward until at the fatigue limit it becomes horizontal.

Vibrating stresses, with some materials, accelerate corrosion.

Fatigue failure may be said to occur when a specimen has completely fractured into two parts. However, in many cases a large number of cycles elapse between the formation of minute cracks to complete failure. Consequently fatigue failure is arbitrarily defined as having occurred when the stiffness of the specimen has been reduced by a specified amount.

Machines used for measuring fatigue may be divided into three types:—**1. Direct Stress.** (Tension or compression or both.) Repeated axial loading by alternating magnetic field or by inertia vibration.

2. Flexural Stress. (a) Repeated loading by:—1. Rotating cantilever loaded by weight or spring. 2. Fixed cantilever loaded by magnetic or inertia vibrator or by rotating spring. 3. Rotating beam in pure bending, loaded by spring or weights.

(b) Repeated deflection by fixed cantilever, repeated constant deflection.

3. Torsional Stress. (a) Repeated angular torque by inertia vibrator.

(b) Repeated angular twist by cam or connecting rod action on a torque arm.

The fatigue test is inherently time consuming and not suitable for acceptance testing.

For materials such as cellulose acetate, which creeps rapidly, the effect of a mean stress, other than zero, is to cause relaxation so that the stress cycle tends to approach the conditions of complete reversal of stress. Tests on thin sheets yield results which vary with the thickness of the sheet.

A good discussion on plastics under repeated stress is given (24), and three types of fatigue machines are noted:—

Rotating beam type. This was originally developed for testing metals but has been successfully used for non-metallic materials.

The loaded test specimen is subjected to a constant alternating bending moment when rotated between two spindles.

It is limited to testing round specimens and is applicable only for tests under zero mean stress.

Repeated constant-deflection crank type. The specimen is subjected primarily to constant alternating deflection by an adjustable crank which transforms the rotary motion of the driving motor into reciprocating motion.

This type of machine is proposed in the American Specification (23), and similar machines have been used by other workers. References are given. Notched or unnotched specimens may be used.

Repeated constant-force oscillator type. The test specimen is subjected to a constant alternating force by a mechanical oscillator which utilizes centrifugal force produced by an eccentrically supported rotating weight.

In the past it has been difficult to avoid inertia effects due to near-resonance vibrations when testing flexible specimens. A commercially available machine with an inertia force compensator is described and illustrated.

The DeMattia Flexing Machine (11) (25) is a constant strain machine giving the fatigue data in terms of repeated bending strain.

Fatigue strengths are more susceptible than static strengths to manufacturing conditions, e.g., curing pressure, temperature, and time.

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Any factor which affects the temperature of the specimen, over and above the testing temperature, will influence the results. The following are of significance:—(a) High-speed testing results in a greater rate of internal heat generation due to damping. (b) Large specimens tend to run hotter than small ones. (c) The percentage of fibres in a specimen subjected to high stress, affects the rate of heat generation and temperature. (d) Torsional fatigue tests will run hotter than direct stress and bending tests.

Fatigue shows itself in a reduction of strength, and is generally measured in terms of endurance limit, i.e., the highest dynamic load which can be sustained without fracture, for a practically unlimited length of time (26).

Three types of apparatus are used in an American Specification (27) to compare the rate of heat generation, and the fatigue characteristics of vulcanized rubber compounds subjected in use to dynamic compression strains.

The Goodrich Flexometer. A definite compression load is applied through a lever system having a high inertia, while imposing on the specimen an additional high frequency cycle compression of definite magnitude.

Specimens may be tested under constant applied load, or a constant initial compression. The change in the height of the specimen can be measured continuously during flexing.

The Firestone Flexometer. In this, a rotary motion is applied to one end of the specimen held under a constant compression load, and the time required for a definite change in height of the specimen is determined.

St. Joe Flexometer. The rate of heat generation and breakdown when flexed under a time-compression load is determined. The machine is designed to determine the point at which incipient failure starts in the centre of the specimen.

There is a useful discussion on the fatigue properties of plastics (28), and although the range of materials of various phenolic types tested had ultimate tensile strengths of 5,500 p.s.i. to 30,000 p.s.i., it was found that in all cases the value of the limiting bending fatigue stress fell within the range of 1.95 tons/sq. in. to 2.40 tons/sq. in.

It was concluded that the type of reinforcement (i.e. filler) which is employed, had only a limited influence on the fatigue limit of the moulded materials. The strength is directly dependent on the strength of the basic resin. The nature of the filler influences the length of time required for the initial crack to propagate through the whole moulded structure.

The fatigue limit of phenolic mouldings with the "resin skin" removed was higher than when it was allowed to remain. This is explained by the fact that the skin is more brittle than the main body of the moulding.

The following table is given:—

Fatigue Properties of Phenolic Plastics

Type of material	Tension fatigue 20×10^6 tons/sq. in.	Bending fatigue 10×10^6 tons/sq. in.
Cast resin	ca 0.58	—
Unfilled resin ..	—	ca 1.93
Woodflour filled ..	1.80	1.96
Cellulose-fibre filled	3.12	2.05
Paper-base laminate	3.40	2.20
Fabric-base laminate	3.60	2.40

Additional types of apparatus are described (29):—

(a) A high-speed rotating beam machine for low temperature testing down to −320° F.

(b) A repeated bending machine for similar temperatures and equipped to enable tests in bending, torsion, or both combined.

(c) A repeated bending machine equipped for testing small specimens ¾ in. long, in either bending or tension.

A method is described (30) for testing rubber-cord bonds to destruction in shear. The type of sample used is such, that it may be subjected to alternate compression and release on the Goodrich Flexometer. This enables the measurement of the fall in adhesion, consequent upon flexing, to be made. Further work is reported (31).

Tests of thin sheet yield results which vary with the thickness of the sheet, even though identical material is used. The thickness should always be reported, and particularly when comparing different materials the same thickness of sheet should be used.

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Plastics Institute Junior Lecture

Members of the Institute who were not able to be present at the first Junior Lecture given on October 4 in London by Mr. K. R. Lawrence, will be interested in the following summary. Mr. Lawrence is of the injection moulding division of British Moulded Plastics Ltd.

THE development of the moulding industry was surveyed from the early use of bituminous plastics, through the introduction of phenolic and urea resins and cellulose acetate. The major developments that took place during the last war were outlined as a basis for the structure of the industry today.

Organization. The organization of a large moulding concern specializing in trade mouldings was discussed from the inquiry stage through design, toolmaking, sampling and production.

The author then proceeded to discuss the various moulding processes used in the industry starting with:—

Compression Moulding. It was pointed out that compression moulding had been the backbone of the industry for many years and that whilst it may not continue to be so, any idea that it was becoming obsolete was completely erroneous. Phenolic, urea and melamine moulding materials were discussed with particular reference to the type of filler, flow of the material and moulding temperatures in relation to moulding technique.

Transfer Moulding. The reasons for the use of this type of technique were outlined and the importance of flow pressure stressed.

Injection Moulding. This was dealt with on a material basis, separate moulding technique being outlined for each material. The cause and elimination of internal stresses in polystyrene mouldings was discussed in detail as an example of the variables likely to be encountered in this type of moulding. Moulding techniques for nylon were also dealt with in some detail.

Extrusion. Equipment and materials used were discussed. Techniques for the extrusion of nylon in particular were mentioned. The importance of extrusion rate, cooling and take-off mechanism was stressed. Fields of application for rod, tube and other sections were surveyed.

Vacuum Forming. Equipment, materials and techniques were discussed. Applications and their effect on injection moulding were outlined.

Reinforced Plastics. Both the laying up and pre-forming techniques for the production of mouldings from polyester-glass composition were discussed. The field of applications was surveyed.

Conclusions. The author stressed the importance of obtaining the right type of technician in the industry. The argument for chemists versus engineers was outlined and the author expressed the opinion that the Associateship of the Plastics Institute would play an ever increasing part in the future structure of the moulding industry.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, price 3s. 0d. each (including postage).

B.P. 735,510. Insulation of electrical equipment. J. H. W. Turner. To: British Resin Products Ltd.

To avoid cavities forming during the curing process, the insulation is produced in two stages. First a fluid composition (vinyl chloride or vinylidene chloride polymer or copolymer) is applied to the article and consolidated, then the article is impregnated with a solventless insulating varnish. The varnish is cured while retained by the polymer.

B.P. 735,532. Electrical insulation. To: General Electric Co. (U.S.A.).

Wrappings of asbestos tape impregnated with a copolymer of ethyl acrylate and methyl acrylate and coated first with layers of a certain condensation product ("A resin"), then provided with an external coating of a certain reaction product ("B resin"), which are consolidated under heat and pressure whereby the wrappings are converted into a unitary insulation.

B.P. 735,564. Synthetic resin binders for making foundry moulding mixtures and such mixtures. J. Fallows. To: Polygram Castings Co., Ltd.

Phenol (or cresol) formaldehyde resin and plumbago.

B.P. 735,677. Coating of glass fibrous strands. To: American Cyanamid Co. (U.S.A.).

With glycidyl or polyglycidyl acrylate (methacrylate) and a polyester resin copolymerized on the strands.

B.P. 735,684. Imparting a permanent fragrance to fabrics. H. Pichlmayr.

The removal of the fragrant substances in washings is prevented by incorporating the ethereal oil used in an aqueous dispersion of a synthetic resin.

B.P. 735,763. Binding or mounting clips. E. F. Emery, F. D. Emery. To: Insuloid Mfg. Co., Ltd.

For securing together groups of electrical wires, e.g., in building electronic apparatus, a strip of thermoplastic material with hook shaped ends and a moulded ring element around the wire bundle to be slipped into the hooks.

B.P. 735,767. Manufacture of elastomeric vinyl resin sheeting and films. To: Union Carbide and Carbon Corp. (U.S.A.).

Vinyl chloride polymers or vinyl chloride—vinyl acetate copolymers are hot calendered to form a sheet or film having a thickness capable of resisting tearing at calendering temperature and then stretched at or near this temperature, finally rapid cooling without further stretching.

B.P. 735,795. Welding of thermoplastic material. To: Soc. de Constructions Mécaniques de Stains (France).

A welding rod is used in the form of a flat strip of unplasticized thermoplastic resin. Especially for welding polyvinyl chloride compositions with a welding rod of that resin.

B.P. 735,815. Capsule-like closures for jars, bottles and the like. M. J. Ibbetson. To: A. Ibbetson and Co., Ltd.

With a filling aperture and a stopper having a pad or a brush integrally attached to it. Polyethylene, polyvinyl chloride, polystyrene and other such materials may be used.

B.P. 735,844. Electric capacitors. W. Schick. To: Stability Radio Components Ltd.

The electrodes assembly is coated with a composition of insulating mineral powder (70%) and a resin binder (oil modified alkyd resins) to bond the mineral particles and assembly parts.

B.P. 735,859. Coating compositions and method of packaging by the use thereof. D. W. Harbour. To: R. A. Brand and Co., Ltd.

A strippable composition for application by spraying. Vinyl copolymer resins or mixtures of such resins (vinyl chloride—vinyl acetate copolymer) is dissolved in a mixture of acetone and toluene and sprayed as protection on painted aircraft surfaces.

B.P. 735, 868. Holders for shaving brushes. A. Simpson.

To be used as a travel case for the brush and incorporating an absorbent pad and air slots.

B.P. 735,887. Crash helmet and method for making same. H. P. Roth, C. F. Lombard. To: Protection Inc.

An outer shell is moulded from layers of fibre glass cloth impregnated with a thermosetting plastic and then the space between the hard shell and an inner temporary rigid support filled with cellular bodies (cellulose acetate in pieces) dispersed in a thermosetting elastomer and cemented to the outer shell. An inner shell of foam or sponge rubber should be added as cushioning layer within the crushable filling.

B.P. 735,904. Sliders for slide fasteners. V. Weber. To: Aero Zipp Fasteners, Ltd.

A reversible slider with a one-piece (moulded) slider body.

B.P. 735,918. Making dies for the production of reduced replicas of dolls' heads and other articles. To: Reliable Toy Co., Ltd. (Canada).

A duplicate is formed from a polyvinyl resin plasticized with a plasticizer in an amount about equal by weight to the resin. This duplicate is shrunk by immersing it in a liquid which is a solvent for the plasticizer but not for the resin. The shrunken duplicate is used as a pattern for making a die.

B.P. 735,945. Structural toy and model building set. G. Favaretto. To: Plastik Universal Soc.p.Az.

The elements are connected by tubular projections fitting into corresponding recesses.

B.P. 735,972. Surgical dressings. To: Johnson and Johnson (U.S.A.).

An adhesive bandage with a stretchable backing of vinyl plastic. The dressing material has the form of spaced absorbent pads.

B.P. 735,995/996. Injection moulding apparatus. A. S. Watkins, G. L. Warsack. To: Produx Corp.

Refers to a feeding head for a plurality of moulds to be successively used and re-used. A sleeve surrounding the screw conveyor has a nozzle with a plurality of spaced sprues. An oscillatable valve engaging the nozzle has also a plurality of sprues each of which are individually but not simultaneously registrable with one nozzle sprue.

B.P. 736,009. Manufacture of patterned thermoplastic sheet material. L. H. Griffiths, W. Saul. To: Semtex Ltd.

A mixture of (polyvinyl resin) compositions of two or more colours is prepared by calendering. One or more of the sheets so obtained are superimposed on a base sheet of one colour contained in the prepared sheets, these sheets are then superficially joined and calendered in the hot state substantially reducing their overall thickness.

B.P. 736,022. Screw extrusion machines. A. B. F. G. Richardson. To: British Insulated Callender's Cables Ltd.

For extruding, e.g., synthetic thermoplastics fed into the barrel in powder, pellet or chip form. The screw has a rear portion of large diameter, compared with the front portion, both portions being separated by a conical intermediate portion. The barrel has a corresponding shape and the intermediate portion can be shifted axially to adjust clearance. The advantages are reduced length, better temperature control, intense and controlled masticating action.

B.P. 736,044. Variable electric resistors. Egen Electric Ltd., J. E. Levi.

For miniature electrical apparatus with an insulating base stamped from "Bakelite."

B.P. 736,051. Lamp shades. A. Page.

Formed from two (identical) panels the adjacent edges of which are interconnected, e.g., by wire staples.

B.P. 736,053. Extrusion head for providing cables with multi-layer coating. To: S.A.S. Lavorazione Materie Plastiche (L.P.M.) di M.I. Colombo and C. (Italy).

To provide a cable in one step with a multi-layer coating (e.g., an inner polyethylene, an outer polyamidic coating), the wire is advanced through an axial bore surrounded by a plurality of annular nozzles coaxial with the bore, each to provide a different layer of coating. Each nozzle has its own press means and feed system.

B.P. 736,102. Production of metal-containing synthetic resins. To: Chemische Werke Albert (Germany).

B.P. 736,125. Electric ceiling roses. J. C. M. Foxcroft. To: Ashley Accessories Ltd.

To facilitate moulding without side pins in the moulding tool, the hollow boss has recesses in its inner face and the inverted arches are formed directly below the recesses, so that the dies can be directly withdrawn.

B.P. 736,170. Freeze-resistant aqueous polymer-containing paint. To: Firestone Tire and Rubber Co. (U.S.A.).

B.P. 736,221. Dispensing container for toilet paper. H. G. W. Hosking.

With a spare roll visible through a transparent sheet to advertise the brand.

B.P. 736,263. Bobbins. A. Beecham. To: Courtaulds Ltd.

A cheap plastic bobbin consisting of a moulded barrel and two flanges, each made

of two bonded layers, one of a thermosetting resin, the other of a reinforced asbestos plastic.

B.P. 736,278. Combined flower-pot base and cover. A. Hille (Germany).

Made by injection moulding with a bottom part and integral upstanding resilient tongues enclosing the flower-pot.

B.P. 736,296. Method and apparatus for the continuous production of cellular resilient materials. G. J. L. Griffin.

Refers to the method of heating foam using metal electrodes.

B.P. 736,317. Self-locking stud insert. To: Nylok Corp. (U.S.A.).

A plug of "Nylon."

B.P. 736,319. Removable sealing means for cartons and the like. I. E. White. To: Illingworths (Plastics) Ltd.

A moulded clip.

B.P. 736,328. Supports for showcards. F. J. McGloin.

A manually deformable block with a slit for the card. The block may be made of polyvinyl chloride.

B.P. 736,382. Rear-view device. To: Régie Nationale des Usines Renault (France).

The backing for the reflecting layer and the mount for this backing are made of plastic material.

B.P. 736,419. Waterproof closure. H. G. Mourner (U.S.A.).

For a garment with flexible strips of, e.g., vinyl chloride—vinyl acetate copolymer. Rounded ribs and grooves on one strip mate with corresponding ribs and grooves of the other strip pressed into each other by a slide.

B.P. 736,449. Coating composition and method of packaging by the use thereof. D. W. Harbour. To: R. A. Brand and Co., Ltd.

A strippable coating composition comprising a vinyl chloride—vinylidene chloride copolymer together with either a chlorinated vinyl chloride polymer or a vinylidene chloride—acrylonitrile copolymer or a proportion of both in a volatile solvent.

B.P. 736,457. Mixtures of glycidyl polyethers and butadiene copolymers. To: N.V. de Bataafsche Petroleum Maatschappij (U.S.A.).

As adhesives for metal. A glycidyl polyether of a polyhydric phenol is incorporated with the elastomeric butadiene copolymer. The composition is vulcanized.

B.P. 736,502. Composite assemblies adapted for use in reinforcing portions of sheet material and for use in bonding portions of sheet material together. To: B.B. Chemical Co., Ltd. Comm. from: B.B. Chemical Co.

Refers to thin permeable flexible vinyl resin sheets with an adhesive patch.

B.P. 736,509. Making thermosealable bags. To: Wingfoot Corp. (U.S.A.).

From two blanks with a heat stable slip sheet between them. Each blank contains at least two thermosealable sheets. The edges of the stack are held in alignment by a heat stable wrapper and simultaneously sealed.

B.P. 736,551. Loading device for moulding presses. W. R. Groves. To: British Industrial Plastics Ltd.

The capacity of each hole in the loading plate is individually adjustable.

B.P. 736,554. Container-dispenser for cosmetics in solid stick form. To: Calumet Mfg. Co. Inc. (U.S.A.).

To permit the sticks to be cast directly into the container. All parts of moulded plastics (urea formaldehyde and nylon).

B.P. 736,601. Water-dispersable adhesives from condensation products of formaldehyde and urea. To: Badische Anilin- and Soda-Fabrik (I.G. Farben-Industrie A.G.) (Germany).

The condensation product is subjected to a heat treatment during or after drying until only 25-40% of constituents remain soluble in cold water. Uniform dispersion of the resin is then obtained and the aqueous solutions have a longer life.

B.P. 736,620. Production of polymethyl methacrylate sheet materials. W. E. Frost. To: I.C.I. Ltd.

Bulk polymerization in the presence of an azo catalyst and of an unsubstituted alkane thiol. Sheets so produced have considerably higher softening points than sheets made in previously known manner.

B.P. 736,625. Lighting fittings. General Electric Co. Ltd., M. H. Mounsdon.

Complicated moulds are required for "Perspex" bowl refractors with horizontal prisms. This manufacturing difficulty can be avoided by making the inside prisms in the form of a tightly coiled screw thread.

B.P. 736,644. Darts. F. Grisley.

A metal nose and a moulded thin-walled hollow plastic body integrally moulded with stabilizing fins.

B.P. 736,660. Attachment means for plastic medallions. A. D. Baker. To: Joseph Lucas (Industries) Ltd.

Fitting for a decorative piece made from plastics for attachment to a road vehicle.

B.P. 736,662. Injection-moulding machines. To: Etablissements Jean Facon and Cie. S.à.r.l. (France).

An automatic machine in which the mould mechanism and the injection piston are actuated by a toothed rack composed of a straight portion and of a curved portion to obtain first a high-speed movement, then a progressively slowing down to zero. Two independent motors control mould and extrusion. The machine is equipped with dosing and heating means and with an automatic weighing device which restarts the machine automatically if the weight of the moulded piece is correct.

B.P. 736,697. Heat-sealing apparatus. F. W. Noble. To: Robinson Waxed Paper Co. Ltd.

The hot surface contacted by the sealing material is a moving band exposed to a source of heat.

B.P. 736,908. Dental protheses and processes for their production. To: Farbenfabriken Bayer A.G. (Germany).

A paste or viscous solution which polymerizes to a plastic material at room or slightly elevated temperature is disposed between a model and a pre-formed base plate. The plate is pressed towards the model till all interspaces are filled and the paste then allowed to polymerize. Suitable materials are, e.g., methyl methacrylate and butadiene, methyl methacrylate and certain acrylates, copolymers of vinyl chloride and acrylates or methacrylates, etc. The plasticizer used must not irritate the tissues of the mouth and there must be permanent adhesion between plate and plastic mass.

B.P. 736,917. Filter elements. To: Fram Corp.

One paper member impregnated with a thermoplastic and thermosetting resin is initially bonded to another similar member and the members are further bonded by heat-setting the resin.

B.P. 736,956. Preparation of particulate highly polymeric materials in a form suitable for transport. J. Billing, C. Bostock. To: British Celanese Ltd.

The material is compressed into a block and a skin is formed by applying a small quantity of a solvent to the surface.

B.P. 736,962. Welts or bindings of plastic material for suitcases and the like. C. F. Lewis.

Extruded polyvinyl chloride may be used as a strip L-shaped in cross-section with increased thickness of the "horizontal branch" towards its edge.

B.P. 736,997. Conveyor belts. Greengate and Irwell Rubber Co., Ltd., D. D. Marshall.

Danger of fire is overcome by enclosing the laminated belt, which is impregnated with natural rubber compositions or inflammable synthetic rubber-like materials, in a non-inflammable outer covering of polyvinyl chloride or copolymers of vinyl chloride with, e.g., vinyl acetate or vinylidene chloride plasticized with non-inflammable materials such as tricresyl phosphate.

B.P. 737,022. Thermoplastic materials and their preparation. L. H. Griffiths, W. J. Evans. To: Semtex, Ltd.

An intimate admixture of coal tar and a copolymer of styrene and butadiene.

B.P. 737,025. Copolymers of vinyl chloride and 1 : 1-dichloro-ethylene. To: Farbenfabriken Bayer A.G. (Germany).

For making lacquers.

B.P. 737,093. Impregnated surgical dressings. J. T. Scales. To: National Research Development Corp.

Impregnated dressings yielding medicament under the heat or moisture of the body suffer from the defect of too short a shelf life the impregnant issuing from the fabric too rapidly. It has been found that a matrix of microporous resinous or cellulosic plastic material (e.g., polyvinyl chloride plasticized with dibutyl phthalate) greatly extends the shelf life.

B.P. 737,111. Process and apparatus for the manufacture of porous moulded bodies from thermoplastic synthetic material. To: Wilhelm Schuler G.m.b.H. Filterstein-Fabrik (Germany).

For making bodies of cylindrical or candle shape, the synthetic resin (polyvinyl chloride and copolymers, polymethyl methacrylate, superpolyamides and copolymers) is contained, in dry powdered or dry granular form, in a heatable mould. When the outer surfaces of the particles are caused to soften they sinter together to form a porous body.

B.P. 737,115. Deaf-aid appliances. R. E. Shelmerdine, G. Lewis. To: Audi-Vis (Lancs), Ltd.

To be mounted within the side arms of a spectacle frame.

B.P. 737,202. Polishing device. C. S. Griffiths, R. Lohn and Co., Ltd. (Australia).

A holder of a block of cellulosic fibre material (insulating board) and a block of polishing material bonded thereto.

B.P. 737,210. Container closures. Universal Metal Products, Ltd., M. Biddulph.

For collapsible tubes with a conical sealing face.

B.P. 737,219. Fillet of thermoplastic for pulleys used with wire cables. To: Becorit-Ges. Wilhelm Beckmann and Co. G.m.b.H. (Austria).

Blocks arranged end to end around the rim of the pulley, each block composed of high molecular weight plastics incorporating inlays of mesh, fabric or layers impregnated with the thermoplastic. Hard polyvinyl chloride is preferred.

B.P. 737,244. Material for precision casting. To: Régie Nationale des Usines Renault (France).

A destructible moulded pattern for casting metals by the lost-wax process consists of a mixture of polyethylene (30-85%) and ozokerite.

B.P. 737,255. Explosive packages. To: American Cyanamid Co. (U.S.A.).

In a seamless tubing of polyvinylidene chloride, polyvinyl butyral, or (especially) polyethylene. These materials are moisture proof, resistant to chemical attack, pliable but of unusual toughness and strength.

B.P. 737,267. Dispersion of fluorochlorocarbon polymers. To: M. W. Kellogg Co.

The surface to be protected is coated with the dispersion a plurality of times and dried between contacts, then heated to fusion temperature. A continuous film of the plastic polymers forms on the surface. Used for glass, electrical insulation, coating of cans.

B.P. 737,272. Method of producing coating compositions from epoxide resins and unsaturated triglyceride oils. To: Devoe and Raynolds Co. Inc. (U.S.A.).

For paints, enamels, varnishes.

B.P. 737,286. Lamination or coating of fluorine—substituted polyethylenes with or on other substances. A. Panagrossi, R. L. Hauser: To: Connecticut Hard Rubber Co.

B.P. 737,365. Method of producing a coating or lining for cable pulleys, driving pulleys or the like. To: Dynamit A.G. vorm. Alfred Nobel and Co. (Germany).

A continuous band coated with weldable thermoplastic synthetic substances (vinyl polymers, polyamides, etc.) is heated before applying it to the pulley to be lined, so that welding together takes place when wound around the pulley. Thus a firm grip is provided for a cable or rope.

B.P. 737,367. Production of cellular structure. E. H. Schwenke. To: Elastomer Chemical Corp.

Production of a plasticized, uncured vinyl ester resin, which can be poured into a mould or spread onto surfaces, which will retain its cellular structure afterwards while being cured. The mass is discharged in ungelled state as an expanded creamy foam.

B.P. 737,374. Curing of resins and resinous materials. C. G. Evans. To: National Research Development Corp.

A composite material of a phenolic resin, electrical resistance of which can be reduced by increasing its temperature, and a material impregnated with the resin (resin impregnated fibrous sheets) is consolidated and heated. Then a low frequency alternating voltage is applied across the composite material. The resin is cured rapidly by the increasing current flowing through the resin.

B.P. 737,388. Non-destructive testing of solid bodies. R. Wilson. To: Kelvin and Hughes, Ltd.

An acoustic coupling medium is used in combination with a rubberized nylon disc.

B.P. 737,424. Heat treatment of strip material by dielectric heating. A. T. Kinder, K. W. Brook. To: Metropolitan-Vickers Electrical Co., Ltd.

The electrodes between which the strip passes are a metal roller and an endless metallic belt so guided as to be partially wrapped around the roller under even pressure on the continuously moving strip. The arrangement is of special importance for the treatment of multi-layer belting of thermo-plastic impregnated fabric to consolidate the layers into a single composite belt. To avoid overheating of, e.g., polyvinyl chloride, bands of glass cloth treated with polytetrafluoroethylene may be interposed between the electrodes and the strip.

B.P. 737,515. Resinous compositions. To: Midland Silicones, Ltd., formerly Dow Corning, Ltd. (U.S.A.).

Silicone-alkyd, epoxide and phenolic resins are blended in certain proportions for high temperature magnet wire enamels for use on "glass served" electrical conductors employed in the winding of motors.

B.P. 737,679. Hypodermic syringes. S. J. Everett. To: S. and R. J. Everett and Co., Ltd.

The injection moulded barrel (polytetrafluoroethylene or polymonochlortrifluorethylene) is provided at its rear end with sealing ridges projecting inwards (0.0002-0.001 in.) and with the front edge facing forwards to present annular knife edges in contact with the plunger.

B P. 737,694. Watch cases. A. Gisiger (Switzerland).

A thin metallic frame is embedded in moulded plastic material constituting a combined glass and caseband. A detachable back is held tightly on to the plastic part.

B.P. 737,697. Hardenable resinous compositions containing glycidyl ethers and hard resinous products prepared therefrom. To: N.V. Bataafsche Petroleum Maatschappij (U.S.A.).

For coating or adhesive purposes.

B.P. 737,736. Protective coating of surfaces. P. Lechler, K. Lechler (Germany).

High-frequency heating is employed and to avoid overheating on the surface and insufficient heating of deeper layers, the surfaces are subjected, immediately before, during or after application of the coating, to alternating magnetic fields of such frequency, energy, density and time that the contact layer between the conductive surface and the coating attains a temperature considerably higher than that of deeper layers.

B.P. 737,741. Tufting buttons. F. P. Whaley.

Head and shank formed in one piece by moulding the shank having an aperture (slot, hook) for receiving a piece of cord. For use in tufting mattresses.

B.P. 737,742. Process of making twine and the twine produced thereby. To: Owens-Corning Fiberglass Corp. (U.S.A.).

Groups of glass fibre strands are coated with a thermoplastic hard resinous material admixed with a rubbery material, wrapped in a strip of paper and compacted.

B.P. 737,752. Loading devices for moulding presses. W. R. Groves. To: British Industrial Plastics, Ltd.

An open-bottom trough-like pellet dispenser receives pellets from a chute and dispenses them into the apertures of a tray. It has the length of the tray but not the width and it is oscillated over the tray during the charging operation.

B.P. 737,796. Process for the manufacture of polyisobutylene articles of high elasticity. To: Deutsche Gold- und Silber-Scheideanstalt (Germany).

In polyisobutylene there is no clearly defined setting range. Its plastic deformability is in some cases (carrierless foils for raincoats, covering for sea cables, container linings) a great disadvantage. When incorporating certain finely divided oxides "cold flow" can be markedly reduced. The articles are shaped in known manner and stretched beyond the elastic limit when worked up into tubes, ribbons, profiled pieces.

THE SWEDISH PLASTICS CONFERENCE

The following is a list of papers being presented by members of British companies at the Annual Swedish International Conference. The Conference is being held in Stockholm from November 16 to November 18 and is organized by the Swedish Plastics Federation.

"Moulding and Fabricating Techniques for Cobex," by W. E. Martin, B.Sc., B.X. Plastics, Ltd.

"P.V.C. Extrusion Compounds," by H. D. Brett, Vinatex, Ltd.

"The Techniques of Moulding Urea and Melamine Moulding Powders," Part I and II, by J. Butler, British Industrial Plastics, Ltd.

"Barrel Finishing Methods of Plastics," by E. C. Emslie, Lacrinoid Products, Ltd.

"Polytetrafluoroethylene," by J. Gadsby Ph.D., Imperial Chemical Industries, Ltd., Plastics Division.

"To Shape Tomorrow," Bakelite, Ltd.

"Trends in Polystyrene and Other Plastics," by V. H. Wentworth, B.Sc., A.R.I.C., A.R.Ae.S., F.I.R.I., Monsanto Plastics, Ltd.

"The Economic Stabilization of Vinyl Chloride Polymers," by H. Verity Smith, Pure Chemicals, Ltd., Plastics Division.

"Electrostatic Charges on Polyvinyl Chloride, Their Generation, Measurement and Elimination," by B. D. Sully, Ph.D., F.R.I.C., A.R.C.S., A. Boake Roberts and Co., Ltd.

"Laminated Timber Constructions—The Glue Aspect," by H. A. Collinson, F.R.I.C., A.P.I., Leicester, Lovell and Co., Ltd.

ANNOUNCEMENT

FAWCETT PRESTON & CO. LTD. OF BROMBOROUGH AND FINNEY PRESSES LTD. OF BIRMINGHAM, BOTH MEMBERS OF THE METAL INDUSTRIES GROUP OF COMPANIES, ANNOUNCE THE FORMATION OF A JOINT SALES AND SERVICE COMPANY WITH THE TITLE:—

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an announcement by

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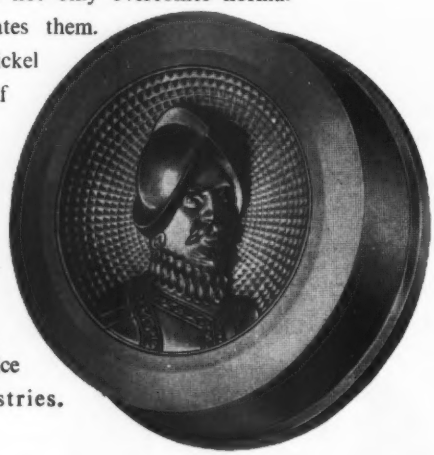

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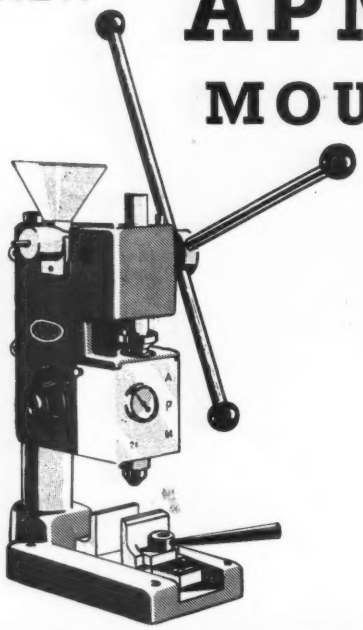

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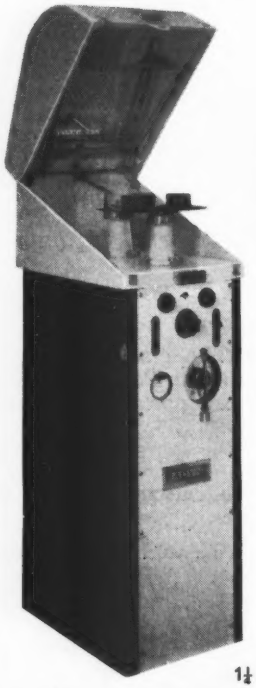

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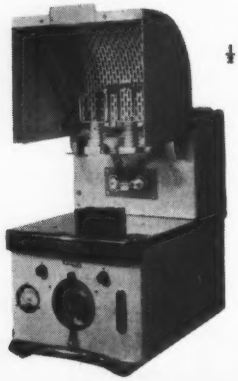
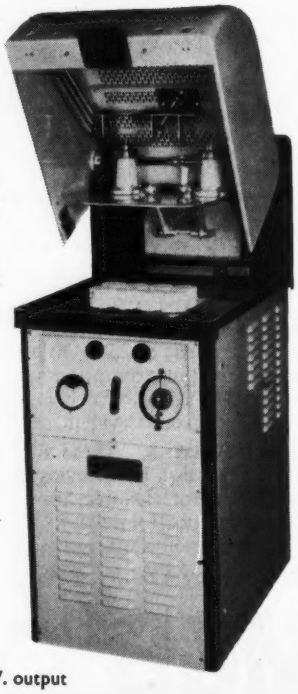


¼ kW. output



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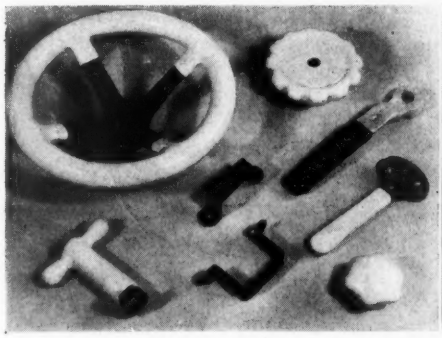

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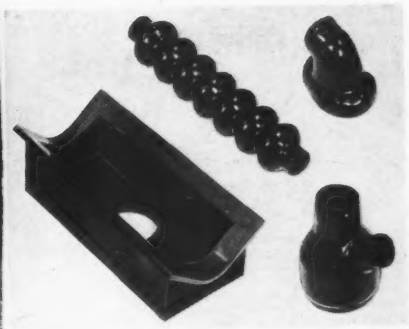

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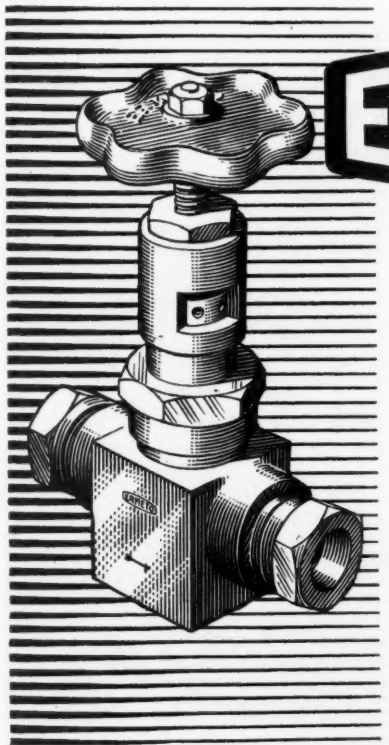

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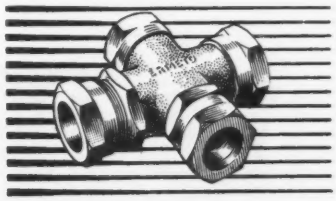

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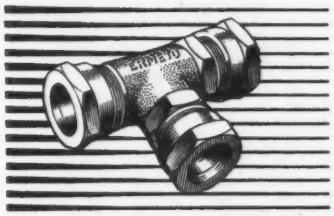

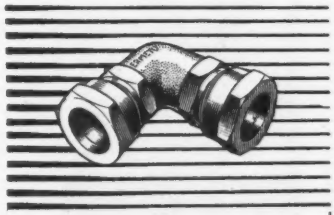

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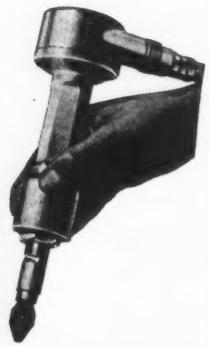

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Lovely to look at and pleasant to handle, but the beauty of Butyrate goes deeper than the surface. The complex detail illustrates its ease of moulding but conceals the strength that makes it a winner even for such articles as chisel handles and hammer tips.

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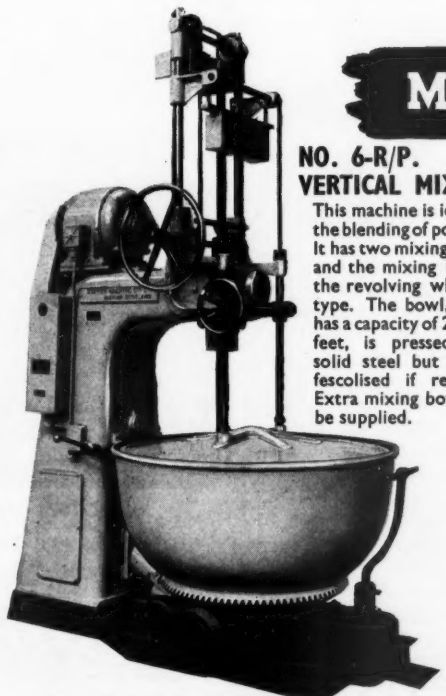

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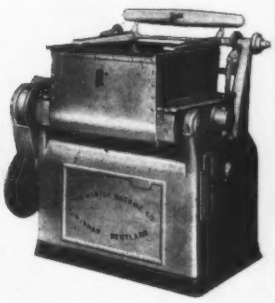
Tilting or non-tilting types.
'Z' type or Naben type Blades can be fitted.



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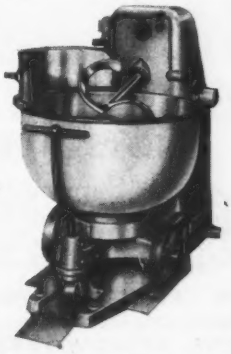

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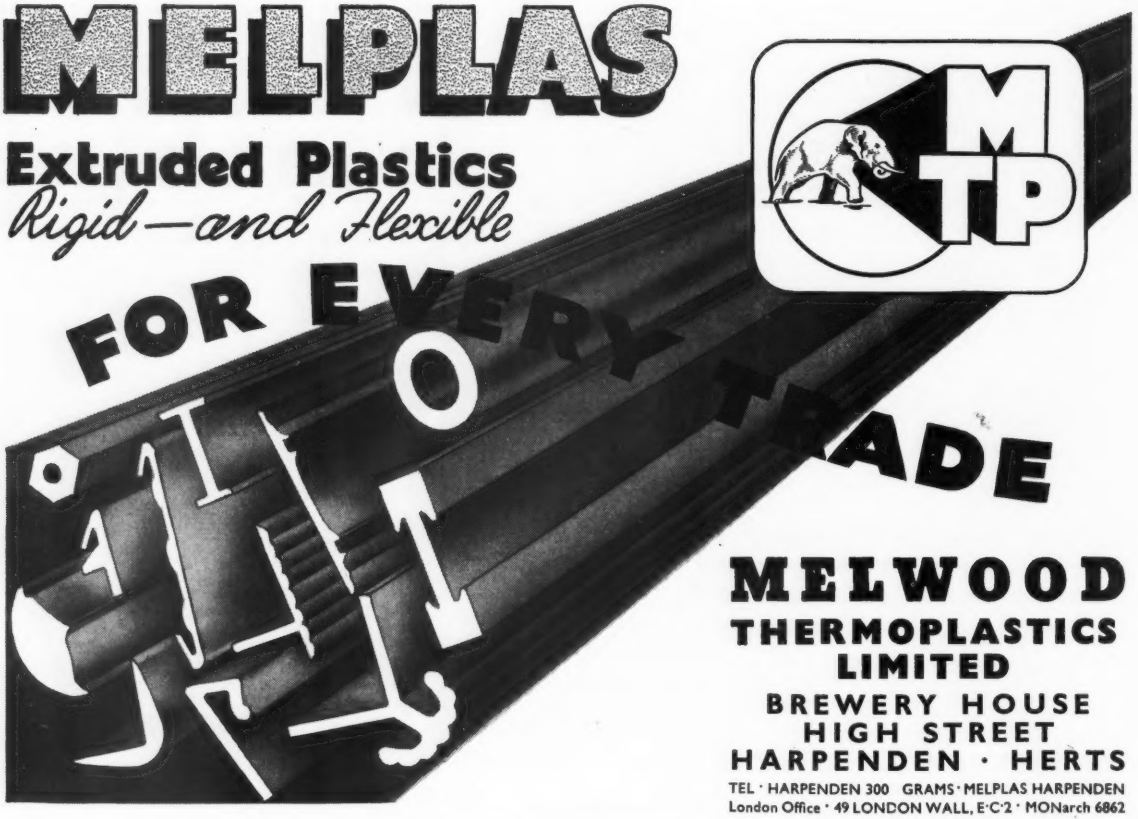

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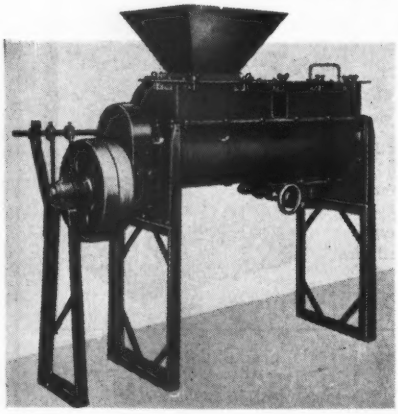

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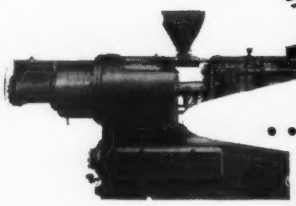
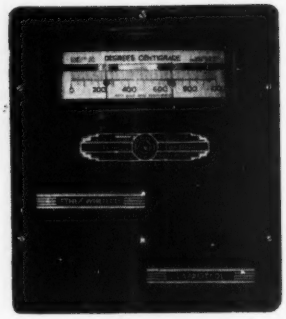


... on Temperatures



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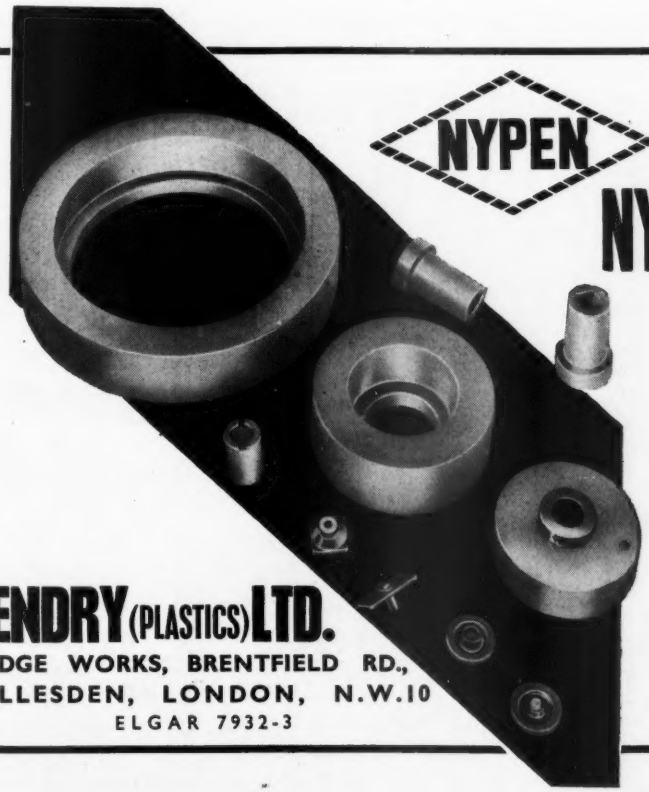

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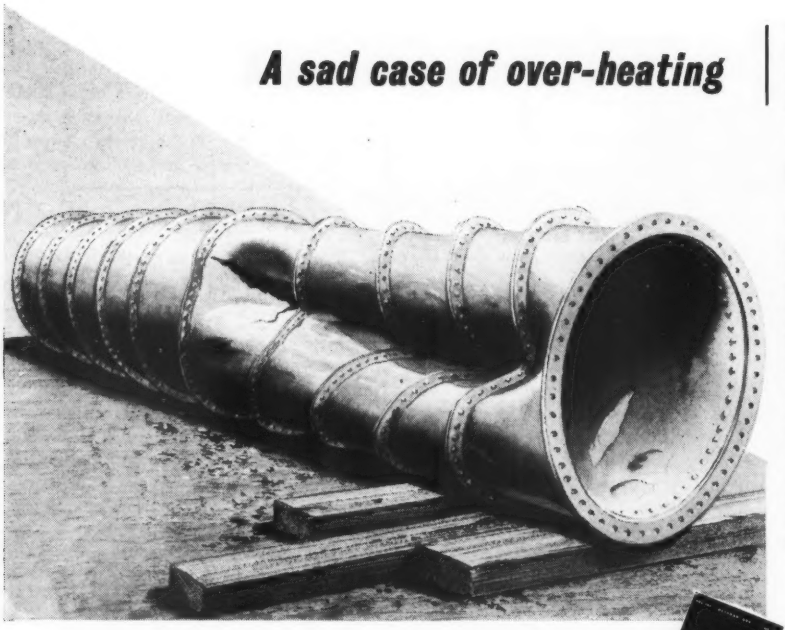

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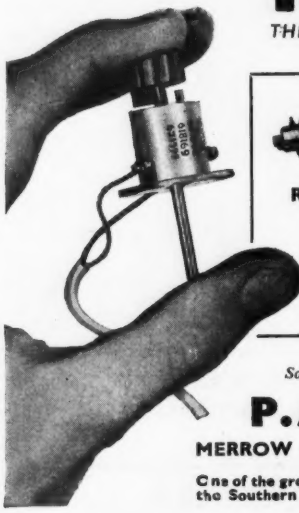

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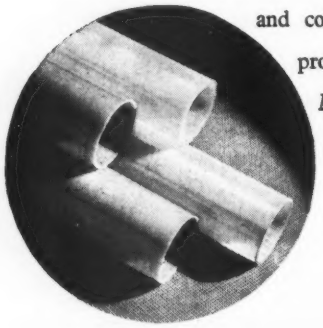

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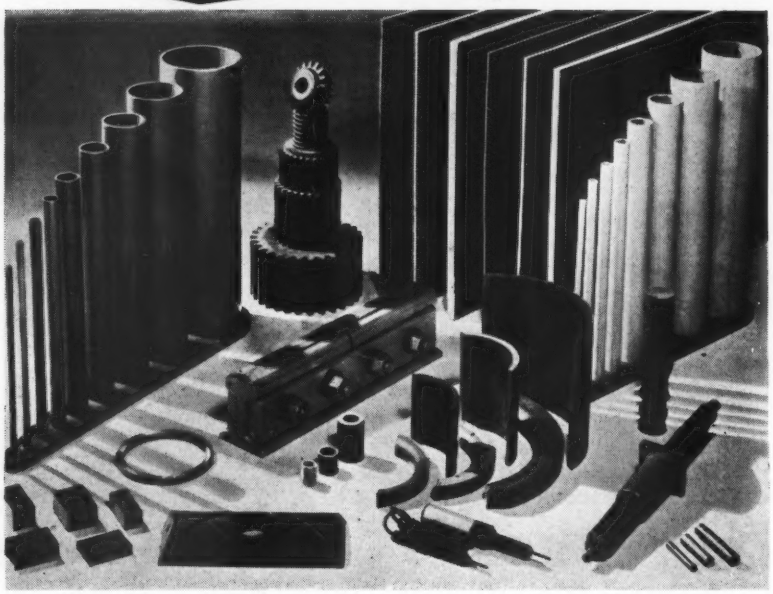

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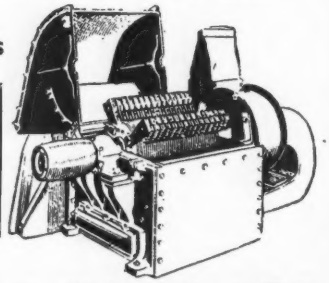

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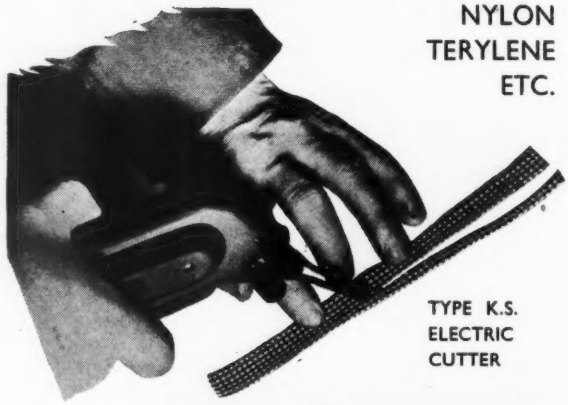

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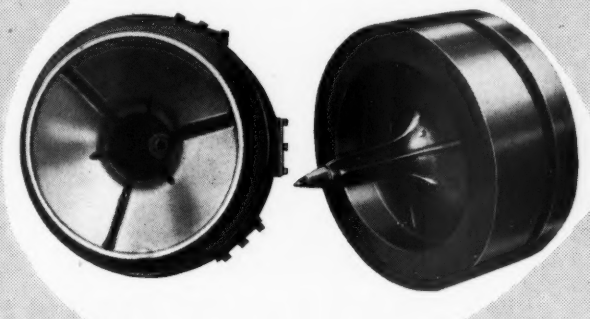

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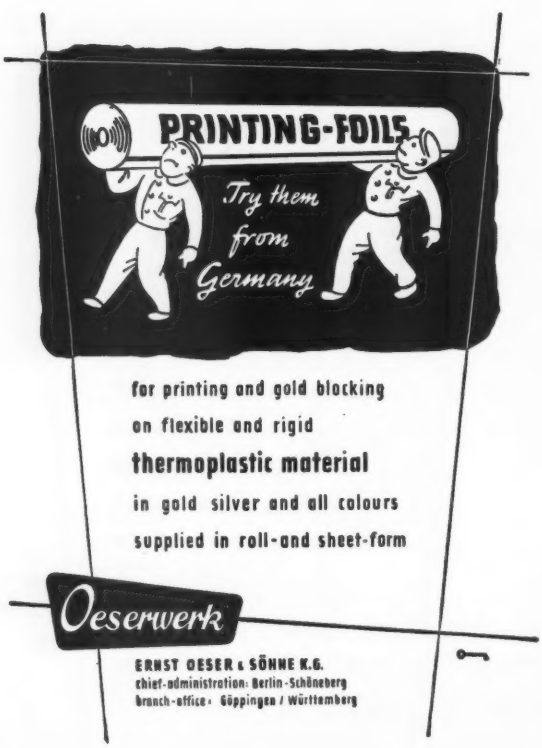

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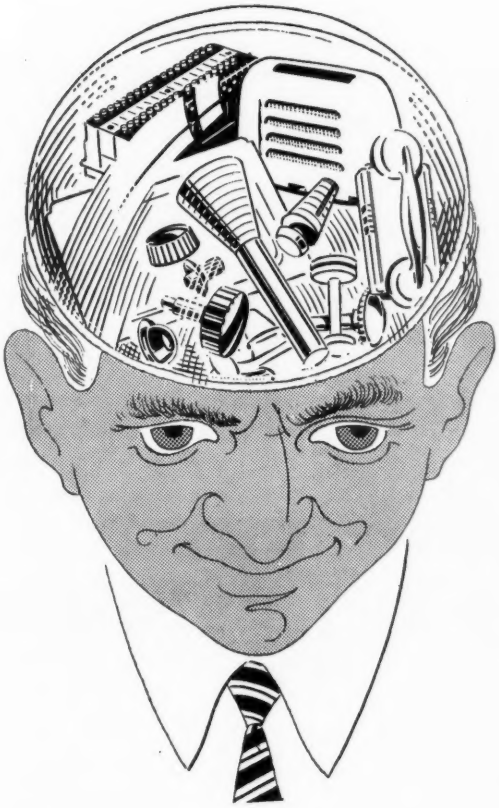

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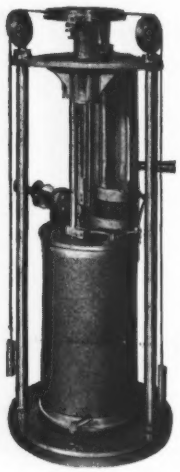

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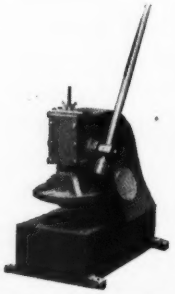

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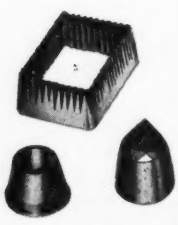

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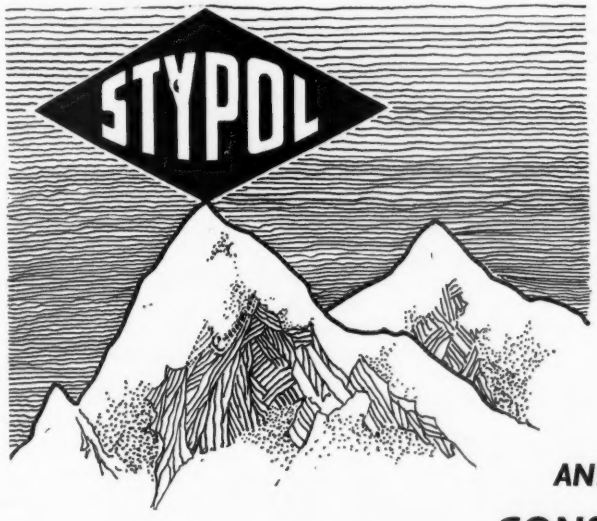

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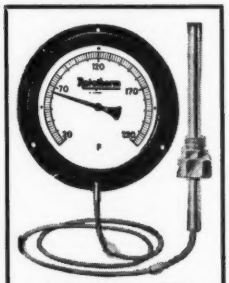
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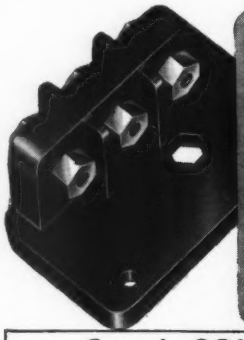
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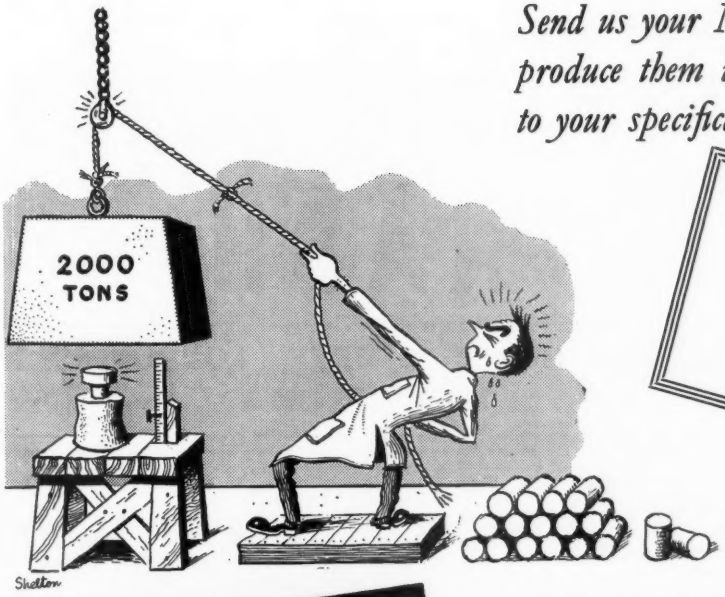

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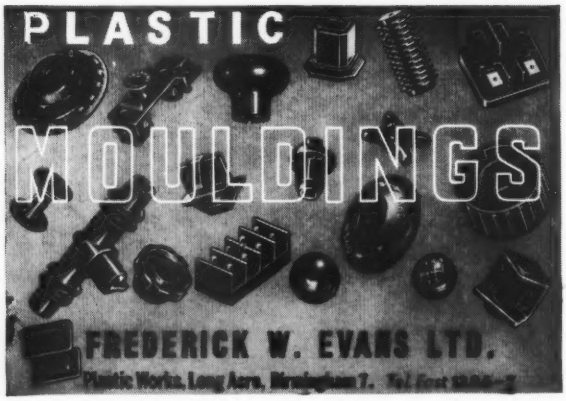

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LARGE QUANTITY of thin P.V.C. oddments, printed and plain, on original rolls. Samples on request. Box P2021, care of "Plastics." 220-50

PERSPEX! PERSPEX!! PERSPEX!!! Official stockists for I.C.I. acrylic sheets. Sheets cut to your requirements. Fabrication and mounting specialists to the trade:—
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RAW MATERIAL WANTED

CELLULOID AND ACETATE CLEAR AND WHITE UNIFORM OFFCUTS 10 and 15 thou. required. Normograph, 70 Princedale Rd., W.11. 221-1163

WANTED, Polythene scrap. Write to Box P7416, care of "Plastics." zzz-0322

P.V.C. GARMENT AND HANDBAG OFFCUTS wanted. We collect and pay cash. Brockwell Plastics, Ltd., 50 Hollingbourne Rd., S.E.24. zzz-490

PROMPT CASH OFFERED for virgin and reprocessed cellulose acetate and polystyrene. Give manufacturers name and backing. Box P873, care of "Plastics." zzz-491

WANTED, large regular supplies of nylon scrap shaving. Hugh Kershaw, Oxenhope, Keighley. 220-1140

WE ARE INTERESTED in buying polystyrene scrap and virgin materials for cash. Box P1127, care of "Plastics." 223-1108

SURPLUS STOCKS of thermosetting and thermoplastic moulding powders wanted. Send details. Box P1727, care of "Plastics." zzz-297

SURPLUS OR REDUNDANT STOCKS WILL BE
PURCHASED FOR CASH.
ANY QUANTITY CONSIDERED.
SEND FULL DETAILS TO:—
LAWRENCE EDWARDS AND CO.,
23-25 KENSINGTON PARK ROAD,
LONDON, W.11.
Phone, Bayswater 4020. 220-1155

ERLANOS LTD., 93 Aldersgate St., E.C. (Monarch 4686), require Perspex and cellulose offcuts and scrap, clear and coloured; highest prices paid. 229-1159

DO YOU HAVE ANY PLASTIC SCRAP TO SELL? Or are you looking for some to buy? Then contact Michael S. Stevens, Ltd., Keswick Rd., S.W.15. zzz-303

WANTED, polyurathane sponge scrape. Write to Box P2028, care of "Plastics." 220-54

THERMOPLASTIC MATERIAL,

ANY QUANTITY URGENTLY REQUIRED.

MULTITEX, LTD.,
7-8 BULMER MEWS,
NOTTING HILL GATE,
LONDON, W.11.
Phone, Park 2611. 220-53

Raw Material Wanted (contd.)

RAW MATERIALS wanted. Polystyrene, polythene, C.A., P.V.C., Diakon, reject moulds, sprues, runners, lumps, etc. Highest price paid. Prompt payment. Also spot lot origin. Box P1020, care of "Plastics." 220-01106

POLYTHENE NATURAL, scrap and surplus material, film and injection-scrap in quantities required. Please offer with particulars to Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 220-25

CASEIN BLANKS wanted, any quantities up to 100 tons, plain and pearl centre. All sizes and thicknesses. Box P2014, care of "Plastics." 220-33

SITUATIONS VACANT

The engagement of persons answering advertisements in respect of vacant situations must be made through a local office of the Ministry of Labour, or a scheduled employment agency, if the applicant is a man between the ages of 18 and 64 inclusive or a woman between the ages of 18 and 59 inclusive, unless he or she, or the employment, is excepted from the provisions of Notification of Vacancies Order, 1952.

DESIGN DRAUGHTSMEN. E. K. Cole, Ltd., Southend, have vacancies in their plastics division for mould design draughtsmen. Experience of injection, transfer and compression mould design essential. Write, stating age, qualifications and experience, to Personnel Manager. 220-23

BRITISH THOMSON-HOUSTON CO., LTD., RUGBY.

Assistant chemists are required in the research laboratory at Rugby for development work involving the preparation and application on a laboratory scale of synthetic resins, varnishes and similar materials. The minimum qualification is a Higher National Certificate.

Applicants are invited to write to the Director of Research, British Thomson-Houston Co., Ltd., Rugby, stating age, qualifications and experience (if any), and quoting the reference SR.2. 220-1156

PLASTICS CHEMIST/TECHNOLOGIST required by well-established company, to work on new and interesting developments.

Applicants should hold at least a B.Sc. general degree, have completed their National Service and not be more than 25 years of age. Please write, giving full particulars, to Box P1930, care of "Plastics." 220-1173

ANALYTICAL CHEMIST (JUNIOR) is required to investigate properties of compounds based on rubber and plastics. Experience in this field is desirable although not essential. There is scope for original work and a varied field of activity, very good working conditions, prospects of promotion excellent, salary dependent on qualification and experience. Reply to Box P1921, care of "Plastics." 220-1171

A PHYSICIST, preferably recently qualified, is required to study the properties of reinforced plastics. Opportunity for fundamental work in an interesting new branch of the plastics industry. Location N.W. London. Very good working conditions, prospects of promotion excellent, salary dependent on qualification and experience. Reply to Box P1917, care of "Plastics." 220-1170

AN EXCEPTIONAL OPENING is available for a chemist required for interesting work on the development and use of cross-linking liquid polymers. Previous experience in this or allied fields is an advantage, but is secondary to intelligence, initiative, keenness and ability to work with others. The laboratories are in N.W. London, but the applicant must be prepared to travel and to work for certain period in other parts of the U.K. and possibly overseas. Very good working conditions, prospects of promotion excellent. Salary dependent on qualification and experience. Reply to Box P1916, care of "Plastics." 220-1169

A DEVELOPMENT CHEMIST is required for interesting work on new compounding methods and application for products based on either natural rubber or synthetic polymers. Experience in this field is very desirable. Very good working conditions, prospects of promotion excellent. Salary dependent on qualification and experience. Reply to Box P1915, care of "Plastics." 220-1168

ASSISTANT ENGINEER, age up to 35, is required by British Cellophane, Ltd., Bridgwater, Somerset. Applicants should have an honours degree in mechanical engineering and have had some practical design and works experience. The duties will be on development, improvement and maintenance of plastic films extrusion plant and ancillary equipment. Write to the Personnel Officer, stating full particulars and salary required, and quote Ref. No. E34. P. 220-1164

EXPERIENCED FOREMAN - TOOLMAKER required. Injection moulding. Good pay for the right man. Box P2017, care of "Plastics." 220-36

TECHNICAL REPRESENTATIVE required by a prominent plastics manufacturer for Midlands and North England areas.

Write giving full details of experience to Box P2016, care of "Plastics." 220-35

SALES REPRESENTATIVE with selling experience of p.v.c. extrusion and mouldings, required by expanding Surrey firm. Good prospects for an energetic and enthusiastic man. Own car an advantage. Box P2015, care of "Plastics." 220-34

OLD-ESTABLISHED COMPANY requires tool-room manager. Must be able to handle large shop. All-round knowledge in production of compression tools essential. Salary commensurate with ability and experience. Box P2011, care of "Plastics." 220-30

Situations Vacant (contd.)

PROGRESSIVE FIRM wishing to manufacture casein blanks requires capable man with full knowledge of its production. Good remuneration given to the right man. Box P2013, care of " Plastics." 220-32

THE TECHNICAL GROUP of a large chemical company manufacturing products for the plastics trade requires chemists or technologists with industrial experience in this field.

The work will include investigation and development of processes and plant producing thermosetting and thermoplastic resins and moulding powders.

Vacancies caused by promotion of staff and general expansion of the company. There is good prospect of advancement.

Modern factory in good area. Non-contributory pension scheme and welfare facilities.

Salary according to age, qualifications and experience. Apply to Box P2012, quoting ref. R.104, care of " Plastics." 220-31

VACANCIES OCCUR in the Research Department of an expanding synthetic resin manufacturer situated in the London area for a plastics technologist, preferably with experience in the fabrication of thermoplastic materials with special reference to high-frequency welding. Qualifications are desirable but not essential. Five-day week. Pension scheme and canteen facilities are available. Salary according to qualifications and experience.

Apply to Chief Chemist, Box P2010, care of " Plastics." 220-29

INJECTION MOULDING. Working foreman required to take charge of small, but expanding moulding shop. Experience in moulding fountain pen parts an advantage. Excellent working conditions. Pension scheme, canteen. Permanent postion. Write Box P209, care of " Plastics." 220-28

WORKS MANAGER, preferably with experience of mass production rubber moulding or plastic, required for factory in Surrey area. Excellent opportunity for man who has been earning £2,000 p.a. plus, and with proved organizing ability and drive.

Apply by letter in strictest confidence to Managing Director, Box P203, care of " Plastics." 220-20

A DEVELOPMENT CHEMIST is required by Ashdowns Ltd., plastic manufacturers, of St. Helens, Lancashire.

Applications are invited from men aged not more than 35 years of age who have obtained a University Degree in Chemistry and who wish to undertake experimental work in connection with polyester resin/fibreglass materials.

Applications should be made to the Personnel Liaison Officer, Pilkington Brothers, Ltd., St. Helens, Lancashire, of whom Ashdowns Ltd., is a subsidiary company. 220-17

PETROCHEMICALS, LTD., have the following vacancies in their Pilot Plant and Works Laboratories.

(a) Shift Leader and (b) Laboratory Assistant on Polyethylene Pilot Plant involving highly interesting work in a new process.

(a) Inter B.Sc. or H.N.C. (Chemistry) preferred and would receive qualifications award, but applicants with any chemical qualifications would be considered

(b) Laboratory or Chemical Assistant for similar work. Minimum of G.C.E. in chemistry essential. Also Laboratory Assistants for Products Control in works laboratory. Minimum G.C.E. in chemistry preferred but previous experience would be considered as suitable.

Good salaries plus shift allowance. Non-contributory sickness and accident benefit scheme. Exceptionally generous voluntary contributory pension scheme. Canteen, etc. Write or phone for interview to:—

Personnel Manager, Petrochemicals, Ltd., Urmston, Manchester. 220-19

A TOOL DESIGN AND ESTIMATING MANAGER is required by Ashdowns, Ltd., Plastics Manufacturers, of St. Helens, Lancashire.

Applications are invited from men aged between 30 and 40 years; they should have had practical experience in engineering and the design and estimating of tools and components and should be capable of bringing fresh ideas into tool and jig design. The duties will also involve the control of the department concerned with estimating and pricing of plastic products.

Applications should be made to the Personnel Liaison Officer, Pilkington Brothers, Ltd., St. Helens, Lancashire, of whom Ashdowns, Ltd., is a subsidiary company. 220-16

PETROCHEMICALS, LTD., have a vacancy for a Chemist who has specialized in, or has industrial experience of, colour chemistry in the plastics or other fields.

This position offers interest and scope in existing and new processes. Contributory pension scheme; non-contributory sickness and accident benefit scheme.

Applications in writing, quoting Reference Col/47, should be addressed to the Personnel Manager, Petrochemicals, Ltd., Partington Industrial Estate, Urmston, Manchester. 220-10

RUBBER IMPROVEMENT, LTD., WELLINGBOROUGH, invite applications for the post of Chief Chemist.

Applicants should be thoroughly conversant with both rubber and P.V.C. in all their various applications.

The post is an executive one and offers wide scope to the right man. Non-contributory life assurance and pension scheme in operation.

Applications should be addressed to the Secretary, Rubber Improvement, Ltd., Wellingborough. 220-2

Situations Vacant (contd.)

FOREMAN for medium-sized injection-compression shop, fully conversant with E.M.B., Peco and Bipel presses. Accommodation available. Pension scheme.

Apply with full details of experience and present salary. Hornflowa, Ltd., Maryport, Cumberland. 220-7

M. AND B. PLASTICS, LTD., require a sales representative for territory covering North of England and Scotland, preferably resident in or near Manchester, age 20-25, previous sales experience desirable, but not essential, provided sound education with scientific or appropriate technical background. National Service completed. Permanent and pensionable position with prospects of advancement.

Apply initially in writing to the Personnel Officer, May and Baker, Ltd., Dagenham, Essex, quoting reference No. 157. 220-5

PLASTICS TECHNOLOGIST required for practical development work covering the application of plastics to chemical plant, age 25-30 years.

Applications, in writing in the first instance, giving full details of age, previous experience and salary required to:—

Personnel Officer, St. Helens Cable and Rubber Co., Ltd., Trading Estate, Slough, Bucks. 220-3

PLASTICS CHEMIST OR TECHNOLOGIST. Petrochemicals, Ltd., require a graduate with experience in the plastics field for work on the processing and product evaluation of low-pressure polyethylenes. Contributory staff pension scheme, non-contributory sickness and accident benefit scheme.

Applications in writing should be addressed to the Personnel Manager, Petrochemicals, Ltd., Partington Industrial Estate, Urmston, Manchester. 221-1178

A VACANCY EXISTS IN THE HIGH-VOLTAGE TEST LABORATORY of Ashdowns, Ltd., Plastics Manufacturers, of St. Helens, Lancashire.

Applications are invited from men aged between 25 and 35 years; they should have had practical experience in the electrical insulation field and should possess a University Degree in Electrical Engineering or an A.M.I.E.E. The work is mainly concerned with the electrical testing of the various plastic materials manufactured and involves the supervision of the work of other assistants.

Applications should be made to the Personnel Liaison Officer, Pilkington Brothers, Ltd., St. Helens, Lancashire, of whom Ashdowns, Ltd., is a subsidiary company. 220-15

NATIONAL COLLEGE OF RUBBER TECHNOLOGY, Northern Polytechnic, Holloway, London, N.7.

The Board of Governors invite applications for full-time appointment as Senior Lecturer in Plastics Technology, with practical experience and extensive chemical knowledge of both thermo-setting and thermo-plastic resins. Salary scale: £1,165 x £25 x £1,315.

Form of application, together with full particulars, will be forwarded on receipt of a stamped, addressed foolscap envelope. R. H. Currell, A.S.A.A., Clerk. 220-11

A SALES REPRESENTATIVE is required by Ashdowns, Ltd., leading Plastics Manufacturers, situated in St. Helens, for the sales development of their industrial laminates.

Applicants should be between 25 and 35 years of age and should have a good record of selling in industry and should preferably have some knowledge of the plastics or engineering industry. The appointment is based in the London Area.

Applications giving details of past experience should be sent to the Personnel Liaison Officer, Pilkington Brothers, Ltd., St. Helens, Lancashire, of whom Ashdowns, Ltd., is a subsidiary company, quoting Ref.: L. 220-14

ASSISTANT PLASTICS DEVELOPMENT ENGINEER required by the Aircraft Division of The Bristol Aeroplane Co., Ltd., at their Weston Factory, Oldmixon, Weston-super-Mare; essential qualifications are O.N.C., and practical experience of reinforced plastics.

Applications, giving full details of age, experience and qualifications should be addressed to the Personnel Manager, The Bristol Aeroplane Co, Ltd., Aircraft Division (Weston Factory), Oldmixon, Weston-super-Mare, Somerset. 220-8

CHIEF TECHNICAL MANAGER for the Plastics Industry. Applications are invited from persons wishing to apply for the position of the Chief Technical Manager to a Company engaged in the manufacture of various thermosetting and thermoplastic sheet and laminated products by the most up-to-date methods. The position is a senior one and the person appointed will be responsible to the Managing Director for all technical investigation and development of new processes and for close collaboration with the Production Manager on the methods of production and the problems arising therefrom.

Applicants must possess high scientific qualifications and must have had experience in raw materials and the products associated with the Plastics Industry.

Full details of the age, qualifications and experience of persons who consider themselves suitable for this position, should be sent to Box 6093, care of Whites, Ltd., 72-78 Fleet St., E.C.4. 220-13

PLASTIC MOULDED TOYS required by nationally-known toy manufacturers in the Midlands; a Technical Designer for plastic-moulded toys. Applicants should have experience in the manufacture of toys or a similar class of product, together with a knowledge of plastics in general. Applicants familiar with plastic moulding machines and the control of operatives will be offered the responsibility of supervising production; salary according to experience, age 26 to 35 years. Box P2032, care of " Plastics." 220-57

Situations Vacant (contd.)

SALES REPRESENTATIVE, 25/40, for progressive injection and compression plastic moulding company. West London; some engineering background and plastics experience desirable, commencing salary £1,000 p.a., plus car and expenses. Permanent post with excellent prospects.

Write giving full particulars, age, experience, previous situations, etc., to Box P2025, care of " Plastics." 220-46

ASSISTANT WORKS MANAGER, compression and injection plastic mouldings, age 25/35 years, Slough district, permanent position, good prospects.

Write in confidence giving full particulars of past engagements, technical training and salary required, etc., to Box P2026, care of " Plastics." 220-47

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.,
CABLE MANUFACTURERS,
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to work in materials and process laboratory dealing with polythene, p.v.c. and other thermoplastics. Extrusion, moulding and compounding experience value. (One with experience of rubber technology.)

RESEARCH ASSISTANT

to work on chemical research problems on polythene, p.v.c. and other cable-making materials.

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PERSONNEL MANAGER,
TELCON WORKS,
GREENWICH, S.E.10. 220-12

DEVELOPMENT TECHNICIAN required by a firm situated in the West of England for pilot plant and small-scale production work in a new project involving use of synthetic resins and compression moulding.

Salary £700 per annum upward dependent on experience. Excellent opportunities for salary and responsibility to grow with development. Pension scheme. Box P2022, care of " Plastics." 220-49

A PROGRESSIVE COMPANY in the East Midlands require the services of a personnel officer to administer and control a staff of approximately 1,000—mainly male.

Applicants must have held a similar post previously and be thoroughly conversant with the machinery for negotiations with the Trade Union, Joint Industrial Councils, etc. Non-contributory life assurance and pension scheme in operation.

Applications in confidence to Box P2020, care of " Plastics." 220-51

SENIOR TECHNICIAN required by company in the North East engaged in the production of thermosetting moulding materials and allied products.

Applicants should have a good practical experience of moulding processes and tool design and should be fully conversant with Quality Control methods. Apply Box P2033, care of " Plastics." 220-45

SITUATIONS WANTED

TECHNICAL DIRECTOR, 34 years, seeks change of employment, 15 years' service, research and production laboratories, with leading chemical concern in dyestuffs, plastics and sales, five years' experience developing laboratory, production and technical service of firm processing vinyls by dip-coating technique, experience and qualifications suitable for technical service or consultant work. Box No. P208, care of " Plastics." 221-8730

COST ESTIMATOR seeks position, similar or sales office representative, good commercial background and sound technical knowledge extrusion, compression and injection moulding and materials. Box P2030, care of " Plastics." 220-x9831

TIME RECORDERS

FACTORY TIME RECORDERS, Service rental. Phone, Hop 2230. Time Recorder Supply and Maintenance Co., Ltd., 157-158 Borough High St., S.E.1. 221-1102

BOOKS AND PUBLICATIONS

THE THEORY OF POLYMERIZATION, by H. R. Fleck, M.Sc., F.R.I.C. Full examination in simple language with examples, calculations and exercises of this fundamental aspect of the chemistry of plastics. Illustrated, 144 pages, 10s. 6d. net from booksellers, or 11s. by post from the publishers, Temple Press Ltd., Bowling Green Lane, London, E.C.1. zzz

PLASTICS, SCIENTIFIC AND TECHNOLOGICAL (3rd edition), by H. R. Fleck, M.Sc., F.R.I.C. A completely revised edition of a recognized standard work on the chemistry and technology of plastics. " . . . should be in every technical library."—Times Review of Industry. Illustrated, 400 pages, 40s. net from booksellers, or 40s. 9d. by post from the publishers, Temple Press Ltd., Bowling Green Lane, London, E.C.1. zzz

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Beardmore

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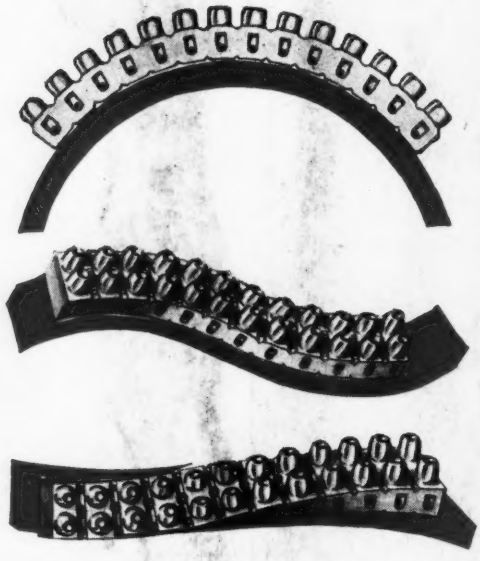


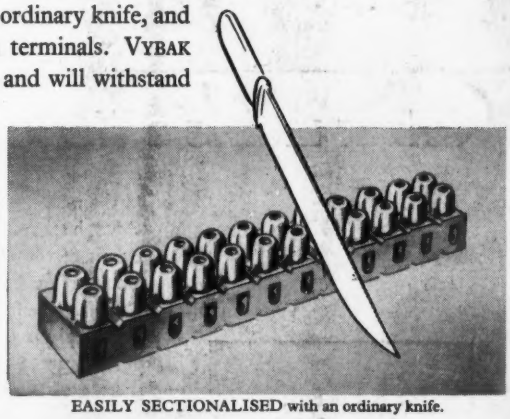
Over the bumps

...round the bends

...along the twists

this Flexible Terminal Block made from VYBAK compounds goes where you want it to go

This flexible terminal strip produced by Belling and Lee Limited was moulded from VYBAK Injection Moulding Compound VX309 — a versatile material made by Bakelite Limited. The resilience of the material not only enables the block to fit curved and irregular surfaces but also to grip the screws so firmly that they cannot be shaken out, even when the block is mounted upside-down. The block can be cut with an ordinary knife, and fixing is easily carried out using the holes between terminals. VYBAK Compound VX309 has excellent electrical properties and will withstand high working voltages even in thin sections. Resistance to mechanical shock and vibration, excellent chemical and fire resistance together with good ageing properties, make VYBAK Compound VX309 a material of immense possibilities in electrical and radio engineering. *You are invited to write for further details.*



EASILY SECTIONALISED with an ordinary knife.

VYBAK REGD. COMPOUNDS

BAKELITE LIMITED

12-18 GROSVENOR GARDENS, LONDON, S.W.1. TEL: SLOANE 0898

Vybak Products include: Vybak rigid and flexible pvc compounds for moulding and extrusion; Vybak calendered sheet; Vybak flexible pressed sheet —coloured or transparent; Vybak heavy grade industrial rigid sheet.